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STATE SANATORIUM AT RUTLAND.

Tuberculosis in Massachusetts

Prepared by the Massachusetts State Committee for the International Congress on Tuberculosis, held in Washington, D. C., September 21 to October 12, 1908.

Edited by

EDWIN A. LOCKE, A.M., M.D.

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PREFACE.

This volume is published by the Massachusetts State Committee, as a supplement to the general exhibit prepared for the International Congress on Tuberculosis, in accordance with the provisions of the following resolve, and with the approval of the State Board of Health: —

CHAPTER 140, RESOLVES OF 1908.

RESOLVE TO PROVIDE FOR AN EXHIBIT AT THE INTERNATIONAL CONGRESS ON TUBERCULOSIS.

Resolved, That there be allowed and paid out of the treasury of the commonwealth a sum not exceeding thirty-eight hundred dollars, to be expended under the direction of the state board of health for the expense of collection, transportation, installation, care and return of a suitable state exhibit at the international congress on tuberculosis to be held in the city of Washington in the District of Columbia from September twenty-first to October twelfth, inclusive, in the year nineteen hundred and eight. [*Approved June* 12, 1908.

While designed primarily for general distribution at the Congress, the Committee has had in mind its special application to the many problems in the tuberculosis work arising within the Commonwealth. The past few years have witnessed such a general awakening throughout the State and the development of so many activities along various lines that it is difficult to get a proper perspective. The object of this memoir is therefore a practical one: namely, to make available for every section of the State information regarding the work done in every other, and to present the most essential features of the general movement. With this object in view, a special effort has been made to give in consider-

able detail an account of the most important work, and to reproduce photographs and plans of the various types of institution.

The lack of accurate and complete mortality, and, to a far greater degree, morbidity statistics regarding tuberculosis in the State has made it impossible to include any statistical investigation of the conditions in Massachusetts.

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INTRODUCTION.

Frederick I. Knight, M.D.

The former high mortality from consumption in Massachusetts and other New England States is well known. It was at first attributed to the severity of the climate, but later rather to various unhygienic conditions, such as vitiated air, poor food and damp soil, and before the discovery of the active agent of the disease the mortality had been greatly diminished by improved hygiene.

Having had such experience, it was not unnatural, when the value of closed sanatoria for the treatment of incipient tuberculosis had been established, that Massachusetts should be the first State to erect such an institution. The establishment of sanatoria, public and private, has served not only to arrest the disease in many patients subjected to their strict régime, but has been of incalculable worth in teaching preventative measures to many others. Unfortunately, the reputation of the sanatorium treatment is suffering somewhat at present in this State, as in others, from exaggerated claims which were made for it, and on account of rather frequent relapses of patients (discharged as cases of arrested disease) after returning to their unhygienic homes and work. Supervision of patients discharged from sanatoria, and, as far as possible, the amelioration of adverse conditions of their lives, must be a part of the great movement against tuberculosis. The gradual inuring of patients to work, and instruction in some healthy occupation before leaving the sanatoria, is a step in the right direction, especially since idleness, when long maintained, has been well called the curse of the consumptive.

Since the discovery of the tubercle bacillus and the infectious-

ness of the disease, the importance of special hospitals for patients with advanced tuberculosis, who cannot be properly cared for at home, is self-evident, and this State has authorized the erection of three such, and the city of Boston one.

But the care of cases of tuberculosis, incipient or advanced, is only a small part of the work.

When the discovery of the tubercle bacillus was announced, the thought came of the eradication of the disease, but the task seemed almost too great to be undertaken, considering the almost universal dissemination of the bacilli; but it was soon realized that the same building up of the human system which would arrest the disease when present, would also prevent its inception in the uninfected, and a movement was begun not only to prevent, as far as possible, the transmission of the germ, but also to put the individual in such condition of health as to prevent its development. So the movement is not merely a fight to combat the disease in those already affected, or even to annihilate the germ, but to make the people immune to it. When there are no susceptible subjects, the germ will cease to exist.

The present report will show how fully the people of this State appreciate the magnitude and at the same time the hopefulness of the task. They feel that every case of tuberculosis discovered should be followed to its home, not only to care for the patient, and insure, as far as possible, against his infection of others, but also to do everything possible to make others immune to the disease. To accomplish this, special organizations have been effected in Boston and other cities, special committees have been appointed from every district of the Massachusetts Medical Society, and the State has been divided, largely on account of the tuberculosis problem, into fifteen health districts, with an inspector in each, to insure as far as possible the hygiene of factories, workshops and tenements, as well as of the families of the working-

men. The Boston Consumptives' Hospital Trustees have undertaken the most thorough following up of Boston cases.

All these special agencies are obtaining more and more the active co-operation of our health boards, State and local, and of all our charitable institutions which have to do with the poor and their homes.

How important all these means are, and how efficient they have already become, may be judged from the chapters which follow. In reading these chapters, one must feel that Massachusetts, with her special sanatoria, hospitals, dispensaries, laboratories, day-camps, prospective out-door schools, her control of bovine tuberculosis, and the combined action of many general and special bodies in following up the disease, has made a most gratifying start in the struggle against this disease.

Chapter I.

THE STATE AND ITS PART IN THE TUBERCULOSIS MOVEMENT.

Arthur T. Cabot, M.D.

The State of Massachusetts exercises supervision over tuberculous patients, and has endeavored to prevent and control tuberculosis by means of the following organizations and institutions. The list covers the efforts made under direct state control and also organizations which are not local but extend their activity over the whole Commonwealth.

1. The State Board of Health.
2. The State Board of Agriculture.
3. The State Board of Education.
4. The State Sanatorium at Rutland.
5. The special wards in connection with other state hospitals and reformatory institutions.
6. The Associated Committees of the Massachusetts Medical Society for the Prevention and Control of Tuberculosis.
7. The Commission to investigate Measures for the Relief of Consumptives, appointed in 1906.
8. The Massachusetts Commission on Hospitals for Consumptives, appointed in 1907.
9. The state inspectors of health.
10. The Federation of Women's Clubs.

1. *The State Board of Health* has been active in combating tuberculosis from the time of its foundation, in 1869. An account of its work is given in the succeeding chapter.

2. *The Cattle Bureau of the State Board of Agriculture* has general supervision over the inspection of cattle throughout the State,

and power to properly dispose of tuberculous cattle that are discovered by or reported to it.

3. *The State Board of Education* is now, in compliance with recent legislation, issuing a pamphlet on the tuberculosis problem, for the purpose of informing the teachers throughout the State as to the essential facts about this disease, to the end that they may present them intelligently to their pupils.

4. *The State Sanatorium at Rutland*, for the treatment of tuberculosis in the early stages, was built in the year 1896, and was the first state sanatorium in the United States. It is fully described in another chapter, and is only briefly mentioned here as one of the most important and successful agencies through which the State has sought to curtail the ravages of tuberculosis.

5. *The various state hospitals* for the insane, the pauper poor and the penal institutions have separated the tuberculous from the other inmates, and in many cases have built specially designed wards for them. The most important of these is at the State Hospital at Tewksbury, where accommodations for about two hundred tuberculous poor are provided in isolated, well-equipped buildings.

Many of the patients in the State Hospital are advanced cases, which are brought there from poor and crowded quarters in which they would be certain to spread infection. In this way excellent preventive work has been accomplished where this work has been of the greatest importance.

The following is a list of state institutions thus providing for the isolation of tuberculous inmates: State Hospital, Tewksbury; State Farm, Bridgewater; State Hospital-School for Crippled Children, Canton; Danvers Insane Hospital, Hathorne; Westborough Insane Hospital, Westborough; Medfield Insane Asylum, Medfield Junction; Massachusetts School for the Feeble-minded, Waverley.

STATE HOSPITAL AT TEWKSBURY.—Hospital for Consumptives.

At Palmer, the Taunton Insane Asylum and the State Hospital at Foxborough there are no consumptive wards, but care is taken to separate such cases and to provide for open-air treatment.

6. *Associated Committees of the Massachusetts Medical Society.* — In 1905 the various district medical societies of which the Massachusetts Medical Society is made up appointed committees to consider the question of the control and prevention of tuberculosis within the State.

In some districts these committees were small, consisting of from three to five members, while in others they were larger, and, seeking to fully represent the various localities, they comprised members from all of the considerable cities and towns in the district.

It soon became evident that the enlargement of the committees was adding to the efficiency of the work, as it led to a more thorough understanding of the conditions and needs of the various localities. The districts having small committees were urged to enlarge them by adding members from all of the large places that were unrepresented. This has been done in most of the districts, so that at the present time these committees comprise one hundred and ninety-four members from one hundred and fifty-six cities and towns.

To promote uniformity of action and of interest these committees were called together at the first annual meeting of the state society after their appointment, and they then voted to join in an organization to be called "The Associated Committees of the Massachusetts Medical Society for the Relief and Control of Tuberculosis." They elected a chairman and secretary and voted to publish a report each year.

The activities of the committees during the first year were directed to studying the conditions as they existed throughout the State, and a brief abstract of their reports was published in the

first annual report. In this report the suggestion was made that efforts should be directed especially to four principal objects, namely: first, perfecting registration; second, procuring thorough and general disinfection after the death or removal of a tuberculous patient; third, the formation of anti-tuberculosis associations; fourth, procuring hospitals for advanced cases.

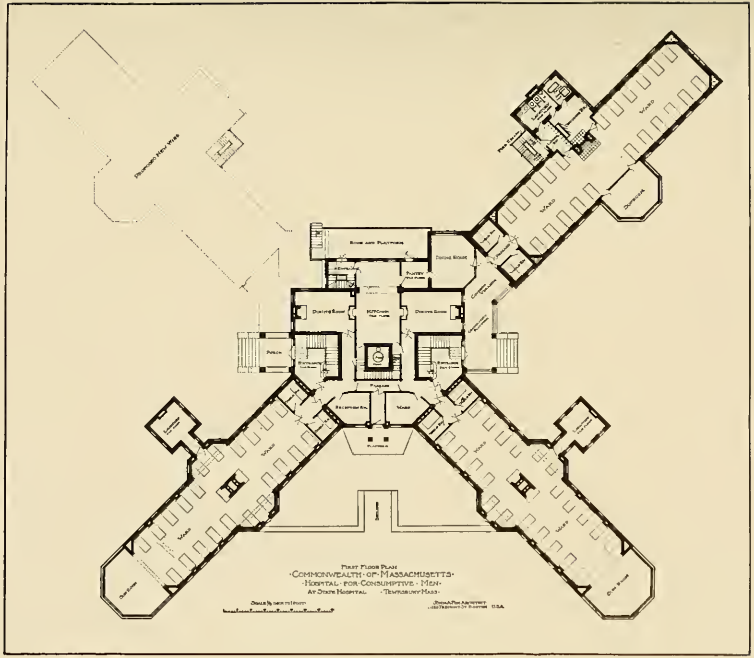
During that year a compulsory registration law was put on the statutes. An act providing for the establishment of three sanatoria for tuberculous patients was passed by the same Legislature. The Associated Committees did their part in promoting this legislation. The success of their efforts to procure thorough disinfection has varied greatly in different localities. In some communities the practice of disinfection has been greatly improved, but it will evidently be a matter needing constant attention until the community is educated to understand its importance and demands it.

The members of the Associated Committees have been active and successful in promoting the formation of voluntary anti-tuberculosis societies. In 1905 Boston, Cambridge, Springfield and Worcester were the only cities in the State having societies of this sort.

During this year Dr. J. C. Pitta, a Portuguese physician of New Bedford, established an anti-tuberculosis society called the "Portuguese League of Assistance to the Consumptives," among his fellow-countrymen in New Bedford.

Just prior to the formation of the committee in the Middlesex North District Medical Society, in 1906, an anti-tuberculosis association was formed in Lowell, with the assistance of Mr. A. M. Wilson, the efficient secretary of the Boston Association.

In 1906–07 anti-tuberculosis societies were formed under the auspices of the local committee of the Associated Committees in Haverhill, Salem, Holyoke, Walpole, Brookline, Brockton and


Proposed New Wing
Ward
Ward
Ward
Ward
Ward
Ward
Dining Room
Kitchen
Dining Room
Pantry
Porch
Passage
Reception Rm.
Ward
Platform
First Floor Plan
·Commonwealth·of·Massachusetts·
·Hospital·for·Consumptive·Men·
At State Hospital ·Tewksbury Mass·

Fitchburg. Similar associations have been formed in Lawrence, Lynn, Northampton, Pittsfield and Clinton during the past year.

Besides these associations in larger towns there are other places in which smaller committees for anti-tuberculosis work have been formed; physicians have started classes for the instruction of tuberculous patients, and visiting nurses have been taught and urged to give especial care in the oversight of their tuberculous cases. The local boards of health have been stimulated and supported by the medical profession in carrying out preventive measures.

The first day-camp was inaugurated by the Boston Association, and proved so successful in economically dealing with the tuberculous poor that the same treatment has been adopted in a number of places, including Cambridge, Springfield, Lowell, Holyoke, Brookline, Fitchburg, New Bedford and Salem.

These are some of the more tangible results already brought about or greatly aided by the Associated Committees.

An equally important effect has been that produced upon the medical profession itself. This organization within the Massachusetts Medical Society was formed to bring the medical men throughout the State into the closest possible touch with the campaign against tuberculosis, to make them acquainted with the work done in other places and to arouse their interest and their confidence in the hopefulness of this endeavor. It is plain that it is largely through the practising physicians that the patients must be reached and placed in proper surroundings for a cure. By them they must be taught how to get well and how to avoid spreading the disease. It is necessary, then, that the physicians be fully informed as to the various agencies that may be asked to assist them in curing their consumptive patients. They must know where to obtain and how to use the various appliances for sleeping in the open air, as plans for cheap sleeping balconies, and should

be informed of the success which has attended this form of treatment, in order that they may themselves be encouraged to use it and may have arguments to convince their patients that it is worth the trouble and expense.

They should also be intimately acquainted with the various sanatoria for consumptives, in order that they may judge of the appropriate place for a particular case, and may also know how most easily to obtain his admission. The Associated Committees, with their members scattered throughout the State, are an efficient means of spreading this information, and of keeping alive the interest of their communities in anti-tuberculosis work.

It is to be expected that, as it becomes more and more widely recognized that consumption in the incipient stage is curable, the physicians, becoming more and more interested in finding their cases while still curable, will make greater efforts to detect the disease in its early stages, and will avail themselves more fully of opportunities to have sputum examinations made in doubtful cases.

The Associated Committees have already had a good effect in helping the medical men in Massachusetts to co-operate in the important field of preventive medicine.

7. *Commission to investigate Measures for the Relief of Consumptives.* — In the spring of 1906, in accordance with a legislative resolve, Governor Guild appointed a Commission to investigate measures for the relief of consumptives and sites for state hospitals for consumptives. After a careful study of the conditions throughout the State this Commission embodied its observations and recommendations in a report, of which the following is a summary: —

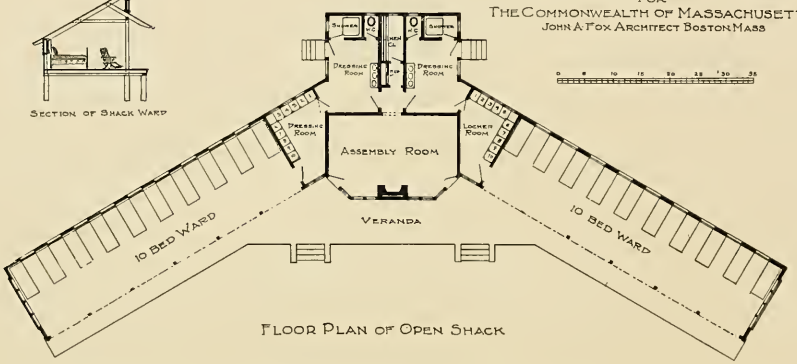
1. As to the number of persons in the Commonwealth who are suffering from pulmonary tuberculosis, or consumption: —

That the total number of cases of pulmonary tuberculosis reported to the Com-

FRONT ELEVATION OF OPEN SHACK

THE MARTIN'S BROOK SANATORIUM
FOR
THE COMMONWEALTH OF MASSACHUSETTS
JOHN A. FOX ARCHITECT BOSTON MASS

SECTION OF SHACK WARD



FLOOR PLAN OF OPEN SHACK

mission is 7,779; of these, 6,376 are private patients of physicians who answered the circular letter sent out by the Commission, and 1,403 are in either private or public institutions located in the State. The number of incipient cases reported is 2,792; the number of advanced, 2,339; and the number of far advanced, 2,648.

2. As to appropriate and available sites for a hospital or hospitals for the treatment of such sufferers: —

That many appropriate and available sites, such as have been described in the text, can easily be found in every county and in the neighborhood of nearly every municipality in the State.

3. As to the probable cost to the Commonwealth of erecting and maintaining hospitals adequate for such treatment: —

That the probable cost of erecting such hospitals would be about $500 per bed; and of maintenance, from $7 to $9 per week per patient.

4. As to the advisability of the undertaking by the Commonwealth of the care and treatment of such sufferers, the Commission advises: —

That the statutes relating to the public health be amended by inserting the word "tuberculosis" after the words "scarlet fever," in sections 49, 50 and 52, chapter 75, Revised Laws; and also by inserting the word "tuberculosis" after the word "smallpox" and after the word "diphtheria," in sections 1 and 2, chapter 213, Acts of 1902.

That section 1, chapter 165, Acts of 1906, relating to the prohibition of expectoration in certain public places, be amended by inserting the words "in any mill or factory, or in any hall of any tenement building occupied by five or more families, or in any school building," after the words "or music hall."

That the State erect three hospitals for the treatment of tuberculosis, to be devoted principally to the treatment of cases in the advanced stages of the disease; one of these hospitals to be located somewhere in the Connecticut Valley, another in the northeastern part and a third in the southeastern part of the State; each of the hospitals to be built to accommodate not over one hundred and fifty patients.

That proper legislation be enacted so as to provide for medical inspectors.

(Signed) Henry P. Walcott, M.D., *Chairman.*
Charles H. Adams.
Jeffrey R. Brackett.
Charles H. Porter.
(Signed) Adams S. MacKnight, M.D.
Charles S. Millet, M.D., *Secretary.*

8. *Massachusetts Commission on Hospitals for Consumptives.* — The Legislature of 1907, after considering the above report, passed an act to provide for establishing three sanatoria for tuberculous

patients, and appropriated $300,000 for this object. Pursuant to this act the Governor appointed the following Commission: Charles H. Adams, Dr. Arthur T. Cabot (chairman), Alvah Crocker, Dr. Albert C. Getchell, William C. Godfrey, Mrs. Sylvia B. Knowlton, Dr. William D. McFee and Jeremiah Smith, Jr.

This Commission was appointed in July, 1907, organized on September 1, and has since that time been actively at work investigating sites and studying plans for the three hospitals above mentioned.

The act as first passed provided that no building should be begun until the plans for all hospitals were complete, but was later amended so as to allow the Commission to start the building of one hospital as soon as it had submitted plans satisfactory to the Governor and Council, which reasonable estimates showed could be built and equipped for $100,000.

The difficulties in obtaining suitable sites have been greater than was anticipated. The obvious requirement of proximity to a railroad, both for economy of administration and to provide easy access to patients and their friends, greatly limits the choice. Economy in construction, necessitated by the small appropriation, makes it imperative to select land that is level and well cleared. A high and dry plateau, where water can be obtained cheaply and where sewage disposal can be safely arranged, is not easily found. One satisfactory site has been obtained and the plans for the first hospital are well under way.

The act creating this Commission is designed to eventually put under its charge all of the state sanatoria and to consolidate all the state anti-tuberculosis work under one Board.

While the Commission has been searching for sites and planning these hospitals it has been issuing bulletins at short intervals, each bulletin dealing with some phase of the tuberculosis problem. These bulletins have been distributed to the newspapers through-

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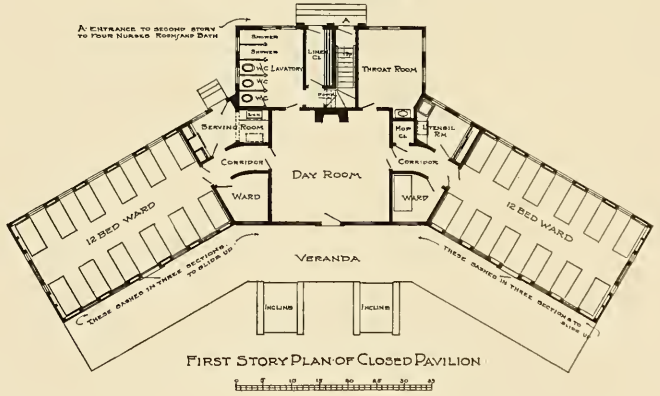


out the State and have been generally published, or in some cases made the basis of an article or "leader."

The Commission has also constantly urged the importance of and assisted in the establishment of tuberculosis dispensaries or clinics, day-camps, anti-tuberculosis associations and visiting nurses in various parts of the State.

9. *Health Districts and Inspectors.* — The Legislature of 1906–07, following the recommendations of Dr. Walcott's commission, ordered that the State should be divided into districts, and that a health inspector, appointed by the Governor, should be assigned to each district. The work of the inspectors is considered at length in a subsequent chapter.

10. *The Massachusetts Federation of Women's Clubs.* — Within the past year the Federation of Women's Clubs has taken an active interest in the matter of tuberculosis. It has had public meetings in various places, with the purpose of educating the community in regard to tuberculosis, and in certain localities has taken an active part in the effort to establish anti-tuberculosis associations, day-camps and dispensaries.

It is greatly to be hoped that the active interest among the women of the State in this important work will increase, as their assistance in educational lines, in establishing societies and clinics for the care of the tuberculous poor, as well as in giving individual assistance to those needing it, can become a very powerful factor in the work.

CHAPTER II.

THE WORK OF THE STATE BOARD OF HEALTH.

Charles Harrington, M.D.

Massachusetts was the first of the States to establish a State Board of Health, and this was done in 1869. Dr. Henry I. Bowditch, whose investigation of the influence of soil moisture on the prevalence of consumption in New England had given him an international reputation as an authority on pulmonary consumption, was appointed chairman, and in his opening address at the first meeting of the Board, in September, 1869, he laid down as one of the fundamental principles of a board of health that it is "bound to take care of the public health, to investigate the causes of epidemic and other diseases, in order that each citizen may not only have as long a life as nature would give him, but likewise as healthy a life as possible."

The Board's first secretary, Dr. George Derby, whose statistical work concerning pulmonary consumption had already attracted much attention, said in his first report: —

> If there is any one disease which more than another would seem to favor the views of the advocates of the predestined and the inevitable, it is that terrible scourge, far more to be dreaded than cholera, consumption. It has been regarded as a special mode intended by Providence to reduce a redundant population, as feeble trees in a forest are crowded out of existence by their more vigorous neighbors. And there is much in the history of the disease which makes such arguments plausible. It is found everywhere in civilized communities, in the South as well as the North, seeming to be generally distributed. Yet the kind of investigation of its natural history and of its causes which we are able to make in these latter days, through the aid of vital statistics, and by the comparison of great numbers of cases, shows that this is far from being true, and places us directly upon the path leading to a discovery of the conditions under which it originates, — conditions

which, when fully recognized, may be avoided. That its causes are many is certain; that some of them are obscure, and even quite unknown as yet, is very probable. But others are fully revealed, and are influencing practice and saving life.

Dr. Derby stated that an examination of the 45,000 deaths from consumption that had occurred during ten years in Massachusetts showed that its distribution in the State was very unequal, in some of the communities the mortality from this disease being two and even three times that of others of equal size and equally stationary population. He emphasized the importance of fresh air, and gave as an illustration the difference in the fate of two individuals with similar consumptive tendency, one choosing to make shoes in an ill-ventilated shop and the other to live the life of a lumberman in the open air, the latter living the longer. "But," he said, "our grandfathers did not know even that. They protected such persons from fresh air, fearing they would take cold, coddled them, nourished them imperfectly, and gave them medicine."

At that time tuberculosis was already declining in Massachusetts, through the influence of private and public hygiene, and in support of his statement to that effect Dr. Derby presented a table showing that whereas in 1853 there were four hundred and twenty-seven deaths from consumption per 100,000 population, the curve showed an almost constant yearly fall, the total decline being about 20 per cent. Comparing the first and the last groups of five years, he called attention to the annual gain of six hundred and eighty-eight lives saved, and ventured the opinion that this saving was due to the advance of medical science, which had given to physicians a better knowledge of the nature of the disease, a better mode of treatment and a greater acquaintance with prophylactic measures. "Fresh air, by day and by night, strong and nourishing food, dry soil on which to live, sunlight and warm clothing are the means of saving many lives which would have been

hopelessly lost in the preceding generation. . . . Let in the sunlight, and never mind the carpets; better they should fade than the health of the family."

In the second report of the Board, issued in January, 1871, was presented an important paper on the ventilation of schoolhouses, emphasizing the necessity of a continuous supply of fresh air, and also an article on air and some of its impurities, in which the importance of dust as an agent in impairing the general health was dwelt upon.

In the same report was presented a reply to the Legislature of 1870, which directed the Board to ascertain the whole number of minors employed in the textile industries of the State, to compare their mortality with that of all other persons of the same age, during the same periods of time, and to report upon the effect of the employment upon their general health in comparison with the effects of other employments upon the general health of other persons of similar ages. At this time it appeared that about 40 per cent. of all of the deaths between the ages of fifteen and nineteen, inclusive, in Massachusetts, were due to pulmonary consumption, and the Board reported that the mortality among minors in factories, so far as could be ascertained from the returns received, was about the same as that of minors in the general population; but attention was drawn to the fact that, when unfit for work by reason of sickness, and particularly in the first stages of consumption, a certain proportion of the operatives withdrew and were lost sight of, and that, such being the case, the rate of mortality among minors in textile factories was really higher than that of those in the general population.

The fourth annual report of the Board presented an analysis of a correspondence on some of the causes or antecedents of consumption with two hundred and ten physicians resident in Massachusetts and elsewhere. At this time consumption was the cause of about

one-fifth of the annual mortality, and in the next report the chairman again referred to it as the most important disease in New England, and dwelt upon the value of sanitary houses, proper food and clothing, and personal hygiene, including exercise, in combating its ravages, devoting several pages to the consideration of each one of these important topics. The evils of damp homes, improper food and too much clothing in cold weather, and the value of long walks in winter, even for young girls, and of keeping the skin in good condition by daily bathing, all received their proper share of attention.

The chairman deemed recreation as of the greatest importance at all stages of life, but particularly in childhood and youth. The open-air treatment of to-day was strongly advocated by him thirty-four years ago. In speaking of children with hereditary tendencies, he said: "Such a child should be compelled to find some recreation in the open air." He would make it a rule that every clerk should walk daily two or three miles, and for a few weeks annually he should leave the city and go to the woods or the seashore. Camping in the woods, yachting excursions, pedestrian tours, — all were recommended as recreations which would be beneficial for all, and especially for those having consumptive tendencies. "Nothing can be worse," he said, "for all youths, especially those hereditarily consumptive, than a too close and constant attendance at school, college or counting-room."

Recognizing the fact above stated, that one-fifth of the deaths in Massachusetts were due to consumption, the Board in its earliest days made an effort to ascertain whether this high rate of mortality could not be lowered; and early in July, 1871, a circular was issued to the profession, not only in Massachusetts, but in the other New England States and elsewhere, for data bearing on the causes of the disease and the factors governing its spread.

In each of the annual reports since 1884 have been presented

charts and tables showing the weekly variation in the mortality from tuberculosis during the year. In the report for 1891 were given a chart showing the mortality from pulmonary consumption from 1883 to 1891, inclusive, and for 1891 separately; a table showing the total deaths for each week of the year for the period of nine years; and a map which showed the extent to which each city and town had been afflicted with the disease during the twenty years ended with 1890.

In the report for 1894 there was presented a chart showing the deaths from consumption per 10,000 living, from 1851 to 1893. The curve is of great interest, and shows a decline from forty-three in 1853 to a fraction less than twenty-three in 1893. It gave also a table showing the annual percentage of the annual mortality, which percentage had fallen from more than 22.90 to 11.25; and the deaths by sex and ages, the seasonal distribution and the mortality with respect to density of population. It appeared that the mortality in dense, medium and sparse districts varied as 1,810 and 727; the term "dense" applying to districts having less than one acre per inhabitant; "medium," where there was more than one acre per inhabitant but less than four; and "sparse," where there were more than four acres per inhabitant.

In 1895 the Board issued a circular, which was distributed extensively throughout the State, to furnish information to the public on: —

1. The nature of pulmonary consumption.
2. The conditions which favor its spread.
3. The best methods of preventing it.

Under the second were discussed defective ventilation, dampness of soil, overcrowding of dwellings, factories and workshops, the influence of dust, of insufficient or badly selected food and of intemperance.

Under the third were presented prophylactic measures, including prevention of overcrowding, household and personal cleanliness, proper selection of occupation, the choice of a well-balanced ration, the avoidance of overwork, anxiety, worry and exhaustion, the disposal of sputum, and disinfection.

A short time after this circular was issued there appeared a monograph written by Dr. J. B. Russell, Senior Medical Officer of Health, of Glasgow, on the prevention of tuberculosis; and, having been brought to the attention of the Board, it was reprinted, with the consent of the author, and 5,000 copies were distributed throughout the State. As the report for 1896 says: "No publication of the Board has been received and read with greater interest, and it is hoped that much benefit will be derived from its circulation."

In 1896 was begun the free examination of sputum or other material for the bacillus of tuberculosis, suitable packages being furnished by the Board for transmitting the material. This work has grown more and more in importance, and during the past few years the number of specimens sent annually to the Board's laboratory has exceeded one thousand. These specimens come from all parts of the State, excepting from those cities and towns which maintain diagnosis laboratories or avail themselves of the services of local bacteriologists and pathologists. At the present time, however, interest in tuberculosis has led to such an increase in the number of specimens that it is impossible to forecast what figure will be reached. Possibly the recently increased resort to the laboratory of the Board may be, in part, attributable to the fact that in 1907 the Legislature passed an act amending certain sections of chapter 75 of the Revised Laws, which made it incumbent upon the Board to declare what diseases should be regarded as dangerous to the public health, and hence notifiable under that chapter. On August 1, 1907, the Board declared eighteen dis-

eases to be dangerous and notifiable, and tuberculosis in all its forms was one of them.

In 1905 the Legislature passed a resolve authorizing the State Board of Health "to cause a public exhibition to be made of the various means and methods used or recommended for treating and preventing tuberculosis, now recognized as a communicable and preventable disease;" and in accordance with the provisions of the resolve an exhibition was held in Horticultural Hall, Boston, from December 28, 1905, to January 7, 1906, inclusive. An auxiliary committee was appointed in order to obtain the co-operation of persons interested in the general subject who would assist the Board in arousing public interest and advise concerning the management of the exhibition. The exhibition was advertised throughout the Commonwealth by means of circulars and circular letters addressed to physicians, philanthropists, boards of health, managers of institutions, secretaries of labor unions, superintendents of schools, officers of all of the colleges and institutions of higher learning, manufacturers, owners of large mercantile establishments and trained nurses. Additional publicity was secured through posters and cards printed in Hebrew and Italian.

The material shown was contributed by various health organizations, institutions and tuberculosis societies and associations, and was exceedingly valuable and interesting. It drew a total attendance of 25,953 persons, or an average daily of 2,359. During the exhibition, a number of special meetings were held, which were addressed by men qualified to represent all classes concerned in this movement, — physicians, employers, workingmen, philanthropists, health authorities, teachers, managers of public and private institutions, and others. These meetings were attended by a total of 5,275 persons. There was also given a series of seven lantern-slide demonstrations, which drew a total of 2,625 persons.

The exhibition fulfilled the purpose for which it was held in a

very satisfactory manner, and led to the holding of many similar though smaller exhibitions in various parts of the State.

In its report to the Legislature of 1906, on the sanitary condition of factories, the Board laid especial emphasis on the influence of dust and lack of ventilation in causing the spread of tuberculosis, and made a number of recommendations concerning the sanitation of factories and the protection of the health of employees. These, with other influences, led to the division of the State into fifteen health districts and the appointment in each of a state inspector of health, one of whose principal duties is to gather all information possible concerning the prevalence of tuberculosis and other diseases dangerous to the public health within his district, and to disseminate knowledge as to the best methods of preventing their spread. Under the provisions of this act all minors employed in factories are subject to examination by the state inspectors of health, who are required to call any condition of ill health or physical unfitness detected to the attention of the minor's parents or employers and also to the State Board of Health. The work of this department of the Board is considered in another chapter.

Chapter III.

THE WORK OF THE STATE INSPECTORS OF HEALTH.

William C. Hanson, M.D.

On June 19, 1907, Governor Guild approved an act which provided for the establishment of fifteen health districts and the appointment of a physician as state inspector of health in each district. This act further provided that the state inspectors of health should be under the general supervision of the State Board of Health, and that they should perform such duties other than those specifically imposed upon them as the said Board from time to time should determine.

Broadly stated, the duties of the state inspectors of health fall into four main groups: each inspector is required to inform himself respecting, first, all influences which may be dangerous to the public health; second, the prevalence of tuberculosis and other diseases dangerous to the public health within his district; third, the health of all minors employed in factories within his district; and fourth, the sanitation of factories, slaughterhouses, public buildings and tenements in which clothing is manufactured. In performing the duties under the first and second, the inspectors act as intermediaries between the State Board of Health and the local health authorities. For example, in the matter of preventing, destroying or mitigating nuisances, which endanger human life or health, the local boards of health have almost absolute authority; but the function of the state inspectors of health is to investigate such nuisances for the purpose of notifying local health authorities of their powers and duties relative thereto, and of recommending such measures as may be deemed expedient for the promotion of

the public health. At the same time copies of all written suggestions made by the state inspectors to the local health authorities are sent to the State Board of Health. In the matter of investigating contagious diseases, and all diseases dangerous to the public health, the inspectors have full power, but may only take steps toward the eradication of any such diseases after consultation with the State Board of Health and the local board. In performing the duties under the third and fourth, relating to the health of minors and the sanitation of buildings, the inspectors act independently of local health authorities and under the direction of the State Board of Health.

It must be clear that the duties of these inspectors are manifold. There is, however, but one object in view, namely, to guard the public health. In this work their position is unique, for with their medical knowledge — which is indispensable to the proper enforcement of the statutes — they may appeal to the medical profession on the one hand and to the laity on the other, teaching all that the promotion of public health is a matter which concerns not only the medical profession but every profession and every individual.

The one health problem which more than all others, at the present time, demands the services of all professions and of every person in his respective sphere, is that of diminishing the prevalence of tuberculosis. Now that the matter has been brought earnestly to public attention, it should be kept before the public, with ever-increasing emphasis upon the importance of sanitary education. Reform cannot be complete as long as sanitary science is considered inferior in interest and importance to any other branch of education.

In this connection it is interesting to observe that the beginning of the state work marks the lapse of upwards of half a century since Lemuel Shattuck brought to the attention of the Massachu-

setts Legislature the necessity for "particular observation and investigation of the causes of consumption and the circumstances under which it occurs," on the ground that "if consumption is ever to be eradicated or ameliorated it can only be done by preventive means and not by cure." The report continues: —

> We cannot too strongly impress upon local boards of health, upon the members of the medical profession, and upon all others interested, the importance of making a united and energetic effort to obtain such observations concerning every case which occurs in every part of the Commonwealth. Nearly three thousand cases in this State annually terminate in death; and if they were properly observed, for a series of five, ten or more years, it is impossible to anticipate the good results which might follow. Possibly, — and even probably, — discoveries might be made which would reduce the annual number of cases, certainly by hundreds, and perhaps by thousands. We shall hereafter suggest a form of a register of cases adapted to this object; and the great importance of the disease, and the confident hope that some discovery can be made which will materially abate its melancholy ravages, should arouse us all to action.[1]

Notwithstanding this valuable recommendation to the Massachusetts Legislature of 1850, it remained for the Legislature of 1907 to pass acts which made it possible for the State Board of Health to require the registration of all cases of tuberculosis, and, through the state inspectors of health, to gather all information possible concerning the prevalence of this disease.

The authority given to the state inspectors for taking steps toward the prevention of tuberculosis is limited only by the many specific statute requirements relative to the sanitation of buildings, and by the express provision that the inspectors shall inform themselves concerning the health of all minors employed in factories. These two spheres of specific duties are themselves immense, and it is easy to forecast a great advancement in sanitary science along the lines which they include; namely, the hygiene of occupation and the sanitation of public buildings, and the sanitation of tenement workrooms and workshops wherein clothing is

[1] Report of the Sanitary Commission of Massachusetts, 1850, page 181.

manufactured. In all these phases of sanitary work the investigation of the prevalence of tuberculosis plays an exceedingly important part. The inspector in a factory community bears in mind the hygiene of the town or city, especially in the workmen's quarters, and is ready to make an investigation of the existence of tuberculosis or of any other disease dangerous to the public health. Within the factory, the inspector, knowing that tuberculosis of the lungs is a common consequence of overcrowding and exposure to vitiated air and dust, — including the various kinds of trade dust and other impurities injurious to health which are generated in the course of the manufacturing process carried on therein, — pays especial attention to ventilation. If, in his opinion, mechanical appliances are necessary for the protection of employees against dust, he may require that such appliances shall be provided, maintained and used. In order to properly inform himself concerning the health of minors employed in a given factory, each inspector is required to ascertain of every minor if the family history discloses illness or death due to tuberculosis, or any disease to which the minor himself seems liable. Whenever the family history discloses illness or death of any member due to tuberculosis, the inspector makes a physical examination of the minor; and in every instance, whether or not a physical examination is made, the inspector submits a concise report on the immediate sanitary conditions under which the minor works, apart from the general report which covers details relative to the lighting, ventilation and cleanliness of the entire factory.

The tenement workroom problem is limited to those tenements and dwellings in which clothing is manufactured by members of the family working there. Persons doing such work must be licensed and the rooms in which the work is done must be kept clean. In case the inspector finds evidence of tuberculosis or other disease dangerous to the public health, as a contagious skin

disease, in one of these dwellings, he may or may not revoke the license, as occasion requires; but whenever he does revoke a license for such reason he is obliged to report his findings at once to the State Board of Health, which notifies the local board of health (unless notification has already been made) to examine said dwelling for the purpose of issuing such orders as the public safety may demand. Since the tuberculosis problem is closely connected with that of the tenement workroom and the workshops wherein clothing is manufactured, and since the majority of these workrooms are situated in Suffolk County, the state inspector of health of this district, Dr. Linenthal, has made a careful study of the types of such dwellings and the sanitary conditions in them. For this reason, and because the types of dwellings and workshops described by Dr. Linenthal include those situated in other parts of the State as well, and because of the practical importance of the investigation, he has been asked to present the facts relative thereto in a separate chapter.

The work pertaining to factory hygiene is of such magnitude and presents so many problems, some of which will require much time and patience for a proper solution, that it is impossible at present to give information which would add appreciably to that already contained in the recent "Report of the State Board of Health upon the Sanitation of Factories and Workshops." In the meantime, there are many things which the public can do and ought to do in order to make the work of the state inspectors of health more effective.

If, for example, any citizen knows of a person suffering with tuberculosis who is not receiving proper care, or who, through carelessness and neglect, is endangering others, it is clearly the duty of that citizen to notify the state inspector for his district. In the same way private individuals, physicians, social service workers and organizations of various kinds may be of great as-

sistance to the inspectors by calling to their attention any unsanitary conditions, diseases or influences dangerous to the public health, or threatening to affect the same. Since the law requiring that every public building and every schoolhouse shall be adequately ventilated is to be enforced by these health officials, medical inspectors of schools and teachers should notify them of any violation of this law. Notice of any ill-ventilated or overcrowded schoolhouse should be brought to the attention of the state inspector in whose district the schoolhouse is located. It is of the greatest importance that factories and workshops should likewise be well ventilated and not overcrowded. Persons who work day after day in crowded rooms which are not properly ventilated must after a time suffer a loss of resistance to disease, and, in consequence, become more susceptible to tuberculosis. This is especially true of a workshop where many people work side by side, some of whom may be suffering with tuberculosis of the lungs. One of the most important duties of an employer, therefore, is to provide fresh air for his employees.

Another duty of the public, equally important with those mentioned, is to remember that a tuberculous person whose personal habits are clean, and who properly disposes of his sputum, is not a source of danger to those about him. Failure to appreciate this fact is already causing many hardships which are both unnecessary and unjust. It is not at all uncommon to-day to hear of instances where the very means of obtaining one's livelihood have been taken away because the person was unfortunate enough to be afflicted with tuberculosis. To take away from such a person the means of obtaining his livelihood is to take it from the very person who needs it most. On the other hand, to meet the problem fairly, the healthy employees, both minors and adults, should be properly protected from all ignorant or careless consumptives. At the present time investigations are being made concerning the health

and the influence of occupation upon the health of children and young persons, but there is no law by which adults working in factories may be examined, and such steps taken as may be deemed advisable or necessary for guarding the public health.

The duties of the state inspectors of health relating to tuberculosis may be stated briefly as follows: first, to gather all information possible concerning its prevalence; second, to disseminate knowledge as to the best methods of preventing its spread; third, to report to the State Board of Health any minor employed in a factory who is known to have any form of the disease; fourth, to report to the State Board of Health and to the proper local health authority every case discovered in a tenement workshop; fifth, to notify local boards of health of any person found to be endangering the public health; and sixth, to see that the notification laws, which require householders and physicians to report any known case to local health authorities, are enforced.

Following are the names and addresses of the state inspectors of health who were appointed by the Governor on the tenth day of July, 1907: —

District No. 1. — Dr. Charles E. Morse, Wareham.

District No. 2. — Dr. Adam S. MacKnight, 355 North Main Street, Fall River.

District No. 3. — Dr. Wallace C. Keith, 237 North Main Street, Brockton.

District No. 4. — Dr. Elliott Washburn, 50 Broadway, Taunton.

District No. 5. — Dr. Harry Linenthal, 327 Blue Hill Avenue, Roxbury.

District No. 6. — Dr. Albert P. Norris, 728 Massachusetts Avenue, Cambridge.

District No. 7. — Dr. J. William Voss, 1 Dane Street, Beverly.

District No. 8. — Dr. William Hall Coon, 70 Newbury Street, Lawrence.

District No. 9. — Dr. Charles E. Simpson, Lowell Hospital, Lowell.

District No. 10. — Dr. William W. Walcott, 32 West Central Street, Natick.

District No. 11. — Dr. Melvin G. Overlock, 91 Chandler Street, Worcester.

District No. 12. — Dr. Lewis Fish, 7 Highland Avenue, Fitchburg.

District No. 13. — Dr. Harvey T. Shores, 177 Elm Street, Northampton.

District No. 14. — Dr. Richard S. Benner,[1] 10 Chestnut Street, Springfield.

District No. 15. — Dr. Lyman A. Jones, 170 Main Street, North Adams.

Under the rules, consideration was postponed until July 17, when the appointments were severally confirmed by the Council.

The division of health districts was made on July 9, 1907. The districts are as follows: —

Health District No. 1. — Includes the counties of Barnstable, Dukes and Nantucket, and the town of Wareham.

Health District No. 2. — Includes the cities of Fall River and New Bedford, and the towns of Acushnet, Berkeley, Dartmouth, Dighton, Fairhaven, Freetown, Marion, Mattapoisett, Rehoboth, Rochester, Seekonk, Somerset, Swansea and Westport.

Health District No. 3. — Includes Plymouth County, exclusive of the towns of Marion, Mattapoisett, Rochester and Wareham, and, in addition, the towns of Cohasset and Weymouth.

Health District No. 4. — Includes the cities of Quincy and Taunton, and the towns of Attleborough, Avon, Bellingham, Blackstone, Braintree, Canton, Dedham, Easton, Foxborough, Franklin, Hol-

[1] Resigned in October, 1907. Succeeded by Dr. Herbert C. Emerson, 177 State Street, Springfield.

brook, Hyde Park, Mansfield, Milton, Norfolk, Norton, North Attleborough, Norwood, Plainville, Randolph, Raynham, Sharon, Stoughton, Walpole, Westwood and Wrentham.

Health District No. 5. — Includes Suffolk County.

Health District No. 6. — Includes the cities of Cambridge, Everett, Malden, Medford, Melrose and Somerville, and the towns of North Reading, Reading, Stoneham and Wakefield.

Health District No. 7. — Includes the cities of Beverly, Gloucester, Lynn and Salem, and the towns of Danvers, Essex, Ipswich, Hamilton, Lynnfield, Manchester, Marblehead, Middleton, Nahant, Peabody, Rockport, Saugus, Swampscott, Topsfield and Wenham.

Health District No. 8. — Includes the cities of Haverhill, Lawrence and Newburyport, and the towns of Amesbury, Andover, Boxford, Georgetown, Groveland, Merrimac, Methuen, Newbury, North Andover, Rowley, Salisbury and West Newbury.

Health District No. 9. — Includes the cities of Lowell and Woburn, and the towns of Acton, Arlington, Ayer, Bedford, Billerica, Boxborough, Burlington, Carlisle, Chelmsford, Concord, Dracut, Dunstable, Groton, Harvard, Lexington, Lincoln, Littleton, Maynard, Pepperell, Shirley, Stow, Tewksbury, Townsend, Tyngsborough, Westford, Wilmington and Winchester.

Health District No. 10. — Includes the cities of Marlborough, Newton and Waltham, and the towns of Ashland, Belmont, Brookline, Dover, Framingham, Grafton, Holliston, Hopedale, Hopkinton, Hudson, Medfield, Medway, Mendon, Milford, Millis, Natick, Needham, Northborough, Sherborn, Shrewsbury, Southborough, Sudbury, Upton, Watertown, Wayland, Wellesley, Westborough and Weston.

Health District No. 11. — Includes the city of Worcester, and the towns of Auburn, Brookfield, Charlton, Douglas, Dudley, Leicester, Millbury, Northbridge, North Brookfield, Oxford,

Southbridge, Spencer, Sturbridge, Sutton, Uxbridge, Warren, Webster and West Brookfield.

Health District No. 12. — Includes the city of Fitchburg, and the towns of Ashburnham, Ashby, Athol, Barre, Berlin, Bolton, Boylston, Clinton, Dana, Gardner, Hardwick, Holden, Hubbardston, Lancaster, Leominster, Lunenburg, New Braintree, Oakham, Paxton, Petersham, Phillipston, Princeton, Royalston, Rutland, Sterling, Templeton, Westminster, Winchendon and West Boylston.

Health District No. 13. — Includes all of Franklin County, and all of Hampshire County excepting the towns of Huntington, Middlefield and Worthington.

Health District No. 14. — Includes all of Hampden County, and, in addition, the towns of Huntington, Middlefield and Worthington.

Health District No. 15. — Includes all of Berkshire County.

CHAPTER IV.

SANITATION OF CLOTHING FACTORIES AND TENEMENT-HOUSE WORKROOMS.

H. Linenthal, M.D.

A great deal has been said and written about the crowded, badly ventilated, poorly lighted tenement houses of our large cities, and we are aware of the fact that these houses furnish conditions favorable to the spread of tuberculosis. Not quite so much is generally known, however, regarding the conditions of the factories or "tailor shops" where men's clothing is made. A brief statement of the conditions found in these shops may, therefore, be of interest to those engaged in the crusade against tuberculosis. It will also throw some light on the causes of the increase of tuberculosis among the operatives of a trade which, in itself, cannot be regarded as the direct cause of the disease.

Although the majority of the tailors in Boston are Jews, who are supposed to possess a relative immunity to tuberculosis, yet — and this is the general impression of the physicians practicing among them — their number afflicted with tuberculosis is on the increase. Most of the tailor shops are located in the North and South Ends of the city. In some instances there are as many as eight or ten in the same building, while the number of workmen employed in each shop varies from ten to sixty. The buildings are for the most part in a neglected condition, and proper sanitation cannot possibly be maintained. For the cleanliness of the stairs, hallways and toilets, which are used by the occupants in common, no one seems to be responsible; they are consequently very dirty. The closets in many cases are foul and reek with filth. The landlord, through a janitor, is supposed to look out for the cleanliness

TYPICAL TAILOR SHOP, WHERE CONTRACT WORK IS DONE.

of the public parts of the building; but the activity of the janitor, if he exists, is not manifest. The interiors of the shops are very unclean; the dirty walls and ceilings appear not to have received a coat of whitewash for years; and the windows are often so dusty as to be almost opaque. In most of the shops the unsanitary conditions of the buildings are made worse by the slovenly, uncleanly habits of the contractors as well as of their employees. Dust, rags and other refuse are allowed to accumulate in the corners of the shops and under the tables. The habit of spitting on the floor is evident in almost every shop. To appreciate fully the significance of this disgusting and dangerous habit one need but visit the shop in operation. Various parts of the garment are made by different operators. When the operator has finished the part alloted to him he throws it on the floor. The garment is then picked up by the foreman, who passes it to the next operator. The dried as well as the moist sputum may thus be freely circulated among the operators by the contaminated clothing. When the shop is swept, as happens on rare occasions, the sweeping is usually dry and helps to stir the dust. Is it surprising that people continually exposed to such conditions become tuberculous?

The attitude of most of the contractors is that filth is a natural and necessary condition, and that it is unreasonable to expect a proper standard of cleanliness. "What do you expect? This is not a parlor or a ballroom." "Of course they spit on the floor; where do you expect them to spit, in their pockets?" "Do you want us to make parlors of our workshops?" were remarks often heard when the unsanitary conditions were pointed out to the employers. In several instances I was told that the employees do not spit on the floor, but on heaps of rags in the corners. Investigation showed that these rags are later sorted by hand in the rag shops.

What is to be said of the possibility that clothing thus exposed

to infection may be a factor in the spread of tuberculosis? There are on record well-authenticated cases where diphtheria was contracted by the wearers of garments manufactured in tenement houses where diphtheria existed. In a disease so widespread as tuberculosis, where the foci of infection are so numerous, it is impossible to trace definitely any one case; but it is quite probable that tubercle bacilli are carried from the shops by the infected garments.

In the opinion of the manufacturers, the conditions in the manufacture of clothing have vastly improved in the last ten years. "At one time," one manufacturer told me the other day, "before the garments were put in the store, it was necessary to air them on the roof to rid them of vermin." This is no longer necessary, as he has "not seen a bedbug in the clothing for a number of years."

The reader will undoubtedly feel that his clothing, at least, is not made under such unsanitary conditions. His clothing, ordered perhaps from a fashionable tailor in the city, is custom-made. I regret to disillusionize him. The fashionable tailor does not make the clothing on his own premises; the cut material is sent out to the shops of custom tailors, most of which are very small, extremely filthy and far more unsanitary than the shops where ready-made clothing is manufactured. From one of these shops, consisting of a room not larger than five yards square, which I had ordered to be cleaned, four barrels of dirt, rags and other refuse were removed. So striking was the change produced in the shop that the owner sent me a letter of thanks for having ordered him to clean his premises. The expensive custom-made suit is thus manufactured under worse sanitary conditions than the cheaper ready-made suit.

Another important factor of the clothing industry from the standpoint of public health is the tenement workroom. In the

CORNER OF SHOP WHERE HIGH GRADE CUSTOM COATS ARE PRESSED.

making of trousers there is considerable sewing to be done by hand, and the contractors, the people who operate the tailor shops, find it cheaper to have this work done by outside finishers, who work for very little and thus set the rate of wage for those who do the same work in the shops. The work of finishing pants is carried on almost entirely by Italian women in the most congested district of Boston. In connection with these workrooms the question of public health becomes quite prominent, and the maintenance of proper sanitary conditions requires frequent inspection. Overcrowding, dark, poorly ventilated and dirty halls, bedrooms with windows opening into narrow, unclean alleys or airshafts, and rooms with no windows at all, are some of the conditions one meets. When confronted with these conditions one cannot help feeling how inadequate are our efforts to prevent the spread of tuberculosis, and how far off we are from striking at the root of the evil.

Among the tenement workrooms inspected I came across a two-room flat on the top floor of a building situated in a narrow, dirty street in the North End. In these rooms there lived a young man of twenty-five with his mother and grandmother. The two women finished pants at home, — their only means of subsistence. The young man was consumptive and unable to work. A small, low-studded room, used as kitchen and workroom, served at night as a bedroom for the consumptive. When I visited the place a kerosene stove was burning and the family dinner cooking. The windows were tightly closed, and the air in the room was suffocating. The young consumptive stayed at home, as he was "indisposed" to go out. He subsequently went to the Rutland Sanatorium for several months, and the disease was apparently arrested. But what chance has he of remaining well when he has to live now in the same two-room flat, under the same unsanitary conditions? In all probability a relapse will occur, and the time,

money and energy spent to arrest the disease must be duplicated, and with smaller chances of success.

The children living in the tenement workrooms are pale and many of them show evidences of impaired nutrition. The infants, however, look surprisingly plump and well nourished. So long as the child receives its nourishment from its mother's milk it thrives. Life to these children is quite a serious affair; they know not of childhood, since at a very early age household responsibilities are thrown upon them. On several occasions I have seen girls of ten or eleven years of age doing the family washing, while the mother was finishing pants.

The finishing of pants, crocheting on ladies' undervests, making children's dresses, nightgowns, overalls, etc., does not include all the work carried on in tenement workrooms. There is a considerable number of other industries carried on in dwelling houses, among which may be mentioned the making of artificial flowers, baseballs, paper boxes, cigars and cigarettes and home laundries. In one house I found an old Italian engaged in cracking nuts for fruit stands. The condition and appearance of the little closet-like room were not calculated to whet one's appetite for fruit-stand nuts. Of all the above-mentioned tenement-house industries, that of wearing apparel is the only one which is carried on under supervision.

Protective legislation in the line of regulating hours of work and employment of minors cannot be enforced in these home industries. The amount of work done by the women is regulated only by the quantity they can get and by their physical endurance. One woman, for example, in addition to her housework and the care of three children, has to work from fourteen to fifteen hours a day on the sewing machine in order to make one dozen pairs of overalls, for which she gets seventy-five cents. Out of this pittance she pays for the delivery of the goods both ways. Her

CLOTHING FACTORY. — Showing Ideal Conditions.

earnings support the whole family, consisting of an alcoholic, shiftless husband and three children. Not only do the women work excessively long hours, but in the evening other members of the family are drafted into service. The vitality and powers of resistance of the tenement workers are thus lowered by the unsanitary conditions of the homes and by the excessively long hours of work. They fall an easy prey to all forms of disease, and especially to contagious diseases, and become a public menace.

To protect the public against the spread of contagious diseases that may occur in any of the tenement workrooms, the bulletins of contagious diseases reported to the Boston Board of Health are examined daily. In case disease occurs in any of these workrooms, the premises are visited and steps are taken to guard against its spread. There is always, however, the danger of unreported cases. For example, a mild case of scarlet fever or diphtheria may run its course without a physician being called in and the case may remain unreported. Moreover, unreported cases of tuberculosis undoubtedly exist among many of the families of tenement workers.

There is also the danger of exposing clothing, in tenement workrooms, to the contagious matter of certain skin diseases which are quite common among the tenement dwellers. As these are not reported there is no way of detecting them, unless accidentally found in the course of inspection. As a matter of fact a number of such diseases have been found, and in every instance work on the premises has been stopped until all danger from their spread has ceased. From July 25, 1907, to May 1, 1908, 1,455 visits were made to tenement workrooms. During that period sixty-three cases of contagious diseases reported from these workrooms were investigated.

I have briefly described the general conditions under which men's clothing is manufactured, both in the shop and in the tenement workroom, and have indicated the dangers to the operatives

as well as to the public from clothing exposed to infectious material. I have also indicated in a general way the methods used to guard the public health against the spread of diseases occurring in the tenement workroom.

As regards the improvement of sanitary conditions in tailor shops, it may be stated that efforts are made to enforce strictly the requirements of the law. Many of the shops have been replastered, whitewashed and renovated in other ways, and a large number have been cleaned. To May 1, 1908, four hundred and forty-one visits were made to two hundred and seventy workshops where clothing is manufactured, and three hundred and sixty-seven written orders were issued. In one hundred and seventy-three reinspected before May 1, the orders had been complied with. The law in regard to spitting and providing receptacles for spitting is receiving special attention. All this, however, is not sufficient. What is of far greater importance is the education of the employers as well as their employees to the necessity of the simplest sanitary measures. This is by no means an easy task. One meets with a general indifference and apathy, quite frequently with obstinacy and antagonism to the enforcement of sanitary measures. Of still greater importance is the need of interesting the wholesale manufacturer, and creating in him a sense of responsibility as to the conditions under which his clothing is manufactured.

The contract system which prevails in the clothing industry is at the root of the evil. The clothing manufacturer has the goods cut on the premises by people in his employ. After the cut material is handed over to the contractor the manufacturer concerns himself but little with the conditions under which the goods are made. In fact, this system puts a premium on the filthy tailor shop. In the close competition existing among the small contractors, the one who has his shop in an old, neglected building

can, in consequence of smaller expenses, make the goods for a smaller compensation, and have the advantage over the one who is in a clean building, with a higher rental. The competition among the contractors is extremely keen; they earn a mere pittance, often less than some of their employees. It can hardly be expected that in the struggle to eke out a mere existence any attention will be given to matters of sanitation. A shifting of the responsibility from the contractors to the wholesale manufacturers would vastly improve conditions. This can best be accomplished by acquainting the public with the existing conditions and by creating a demand for cleaner clothing.

To summarize briefly: the inadequate rate of wages, the excessive hours of labor, the unsanitary state of the shops, make of our clothing industry a sweating industry, with all the predisposing factors of tuberculosis in full operation.

Before concluding I desire to call attention to the present inadequate methods of supervising persons ill with tuberculosis. Every person so afflicted who is reported to the Boston Board of Health is visited by a physician of the Board, and the family is instructed as to what measures should be taken to guard against infection. But the supervision of the patient at his work, though fully as important, is entirely omitted. Every tuberculous employee should be visited at his work in the factory, and the employer or foreman instructed as to what precautions should be taken to guard the health of the other employees. The great difficulty at present in carrying out such a supervision is one of our own making. We have been emphasizing the contagious nature of tuberculosis and thus creating a dread of the disease. A person afflicted with it, however clean he may be, is regarded as a pest by both employer and employees, and they do not want him in the shop. Considering that the largest number of consumptives have to remain at their work, this unwarranted dread of having them in the factory

or workshop is a tremendous hardship. Moreover, it is a very powerful motive to conceal the disease, and prevents the person afflicted from taking any precautionary measures which would in any way indicate that he is tuberculous. As long as he spits on the floor, for example, he can remain quietly at his work without being molested; should he, however, take any precautions, such as using a sputum cup, or having a separate receptacle for spitting, suspicion is immediately aroused, and he is in danger of losing his position.

In our preaching about the dangers and contagiousness of tuberculosis let us emphasize a little more the fact that a person ill with this disease, who has clean personal habits, may attend to his work without endangering his fellow workmen. The education of the public along these lines will not only render justice to the consumptive, but will enable us to supervise him at his work in the factory and workshop.

Chapter V.

BOVINE TUBERCULOSIS IN MASSACHUSETTS. A HISTORY OF THE EARLIER AGITATION CONCERNING IT, AND EFFORTS OF THE STATE FOR ITS ERADICATION AND CONTROL.

Austin Peters, M.R.C.V.S.

To the late Noah Cressy, M.D., V.S., Ph.D., of Hartford, Conn., is due the credit of the first attempt to call the attention of the farmers of Massachusetts to the nature, importance and seriousness of bovine tuberculosis. As a speaker at several farmers' institutes in the western part of the State in the winter of 1879 and 1880, held in western Worcester, Hampshire and Hampden counties, he first started the agitation against this disease. His addresses created quite an excitement for the time being among the farmers in the localities where these institutes were held, and were reported quite extensively in the "Springfield Republican" in January and February, 1880, but attracted very little attention beyond this, and the excitement soon subsided.

The report of the first farmers' institute at which Dr. Cressy (who at that time resided at Amherst) spoke is in the "Springfield Republican" of January 30, 1880. The article is headed "A Rural Sensation," and is an account of a meeting held at Warren the previous day, where he gave a lecture on "The Diseases of Farm Animals," among which he included tuberculosis in cattle. Among other things he said that the herd of cattle at the Massachusetts Agricultural College was infected with tuberculosis, and that the trustees were allowing cattle of various pure breeds to be bred there, and permitting the progeny to be sold to the farmers of the State for the purpose of improving their stock, whereas in reality animals were being sold that were infected with a dangerous

disease, which in this way was being disseminated among the herds of the Commonwealth.

A sensation was created during the lecture by the appearance of a Mr. Paige of Hardwick, in a wheeled chair, who told how he bought three Ayrshire heifers from the Agricultural College in the spring of 1877, that in November, 1879, he had one killed for beef and found her badly diseased, and that he attributed his paralysis and also a blood poisoning in his children to the use of the milk from these heifers. He also showed specimens from the side of one of these heifers, which Dr. Cressy said were lesions of tuberculosis of long standing. He also gave it as his opinion that Mr. Paige's paralysis and the sickness in his children might have been caused by the use of milk from tuberculous cows. Dr. Cressy also referred to an auction sale of cattle at the Agricultural College during the previous summer, and the possible harm to the herds of the State by the dissemination of these animals.

The report of the meeting also conveys the idea that Dr. Cressy, who had formerly been Professor of Veterinary Science at the Agricultural College, had severed his connection with the institution on account of differences of opinion between himself and some of the members of the faculty upon the question of bovine tuberculosis. The "Springfield Republican" of January 31, 1880, quotes Prof. Levi Stockbridge, who had been at the college thirteen years, as saying that the college never bred an animal that had tuberculosis there or developed it within two years of the time it was sold; furthermore, that the statement that Dr. Cressy left the college because he disagreed with some of the faculty on the presence of tuberculosis in the college herd "is an unmitigated and outrageous falsehood." Professor Stockbridge is also reported as saying that "the disease is only consumption, and may attack any breed of cattle in any part of the country; that the milk is healthy until the animal's constitutional vigor is utterly reduced; and that

Mr. Paige's statement that the milk gave him paralysis is preposterous."

The "Springfield Republican" of February 4, 1880, has a short interview with Dr. Cressy, in which he speaks of a cow sold to a farmer at South Amherst, at the auction held early in the summer of 1879, afterward killed at the slaughterhouse and found to be badly diseased with tuberculosis. It also mentions that two other Amherst farmers, who were at the auction with the intention of buying, did not bid on any animals because Dr. Cressy, who was present, advised them not to.

In another column on the same date is a short editorial, advising that the college authorities should court a most searching investigation, with a view to either disproving Dr. Cressy's assertions, or, if true, to setting matters right.

The "Springfield Republican" of February 5, 1880, has a report of a farmers' institute at East Longmeadow, at which Mr. W. H. Bull of West Springfield read a paper on "The Farmers' Duty to the Massachusetts Agricultural College," after which Mr. Phineas Stedman of Chicopee, a trustee of the college, spoke of the Paige cattle, saying they were sold to Mr. Paige in 1877 and might have become diseased since; that he had bought cattle from the Agricultural College and put them in his own herd and never found any that were not healthy.

An account of a farmers' institute held at the town hall in Brookfield, February 5, 1880, is contained in the "Springfield Republican" of February 6, 1880. This meeting was largely attended, as Dr. Cressy's previous lecture at Warren had attracted a good deal of attention. Professor Stockbridge, then Professor of Agriculture at the Massachusetts Agricultural College, was present and took the platform early in the proceedings. He had a newspaper with a report of Dr. Cressy's previous lecture in his hand, and read passage after passage of Dr. Cressy's statements concerning the

college herd and the sale of diseased animals from it, and asked him as he read each sentence if he (Dr. Cressy) ever made any such statement, and as each question was asked, Dr. Cressy would shake his head. As a matter of fact, Dr. Cressy's statements concerning the condition of the college herd and the danger to other herds by the introduction of cattle from it into them were correct. At that time a cat could not be kept in the cattle barn at the Massachusetts Agricultural College without developing a cough, becoming emaciated and pining away in a few months. Dr. Cressy should have maintained the position he took at first, but evidently lacked the courage to do so. After Professor Stockbridge finished his remarks Dr. Cressy gave a very good talk on bovine tuberculosis, its nature and the danger from it to the herds of the State, refraining, however, from any allusion to the condition of the herd at the State Agricultural College.

This seems to have been the end of the agitation regarding bovine tuberculosis in Massachusetts so far as Dr. Cressy was concerned. What he said did not carry a great deal of weight for the reason that the farmers thought him a disgruntled individual, who was endeavoring to injure the college because he had been dismissed from the faculty a few years before, at a time when the trustees of the college had to economize and decided that the position he held could better be dispensed with at the time than any other. If it had not been for the prevailing idea that he was airing a grievance, which discredited his endeavors, much good might have come from the agitation he started. Cressy's ideas were evidently largely taken from Walley's "Four Bovine Scourges," and were decidedly in advance of the times. In his "Four Bovine Scourges," published several years before Koch's famous discovery, Walley includes tubercle with the other three great contagious diseases of cattle, viz., contagious pleuropneumonia, foot and mouth disease, and rinderpest. In the preface to his work he

speaks of these four diseases as being of "more importance to the stock owner than all the other ills to which bovine flesh is heir." He also says that, while "the three first-mentioned diseases are only too well known, the last (tubercle) is less perfectly so, even, it may be said, to the veterinary surgeons."

He further expresses his belief in the communicability of tuberculosis from one animal to another, the danger to man from the use of milk and meat from tuberculous animals, and his opinion that tuberculosis is identical in man and the lower animals. He quotes from the experiments of Villemin, Gerlach, Viseur, Grad, Zundel and other veterinary and medical authorities in support of his views.

In his lectures at the farmers' institutes Dr. Cressy simply voiced Walley's opinions, and the views he then expressed were no less true, nor did they differ from the views held by many scientific men at the present time, but they were not then generally accepted as true by the medical profession, because they lacked the conclusive proof later furnished by Koch when he announced to the world his discovery of the tubercle bacillus. There were a few faint echoes following the agitation started by Cressy, although nothing more was heard from him personally. The "Springfield Republican" of February 9, 1880, mentions the report of the trustees of the Massachusetts Agricultural College for the year. The part relating to the college herd reads in part as follows: —

> That from the most thorough investigation we have been able to make, the statement that disease has been propagated by the sale of cattle from the college farm is absolutely false, and we ask that the matter be referred to the commissioners of contagious diseases for a most rigid investigation.

There are two or three other references to the matter in later issues of the "Springfield Republican," only one of which it is necessary to quote. The "Springfield Republican," February 12, 1880, reports a farmers' institute at Northampton, at which

Professor Stockbridge spoke. At the close of the meeting resolutions endorsing the work of the college were passed, one of which was as follows: —

Resolved, We believe the reports of the disease, tuberculosis, exaggerated, and the attempt to connect the college with it unjust.

The Cattle Commissioners in their report to the Legislature of Massachusetts, January 7, 1881, refer to bovine tuberculosis as follows: —

Owing to a prevailing feeling that we are liable to an outbreak of contagious pleuropneumonia, or from ignorance of its mode of propagation, the Board are frequently notified of supposed cases of this disease; but they have always proved to be simple lung fever, or tuberculous consumption. Some of these cases are very severe and fatal, and cause no inconsiderable loss to stock owners. A narrative of one of them will suffice for all, and may indicate some of their causes and means of prevention. Early in October we were notified by the selectmen of Grafton, in Worcester County, that cattle at a designated locality in that town were suffering from a supposed contagious disease. Visiting the farm we found a large herd of generally very fine looking and highly prized cows. The owner informed us that some of them had indicated disease for many months. One had already died; two more were much emaciated, and probably past recovery; and three or four others coughed more or less severely. The symptoms of the sick animals were such as might exist in the contagious form of the disease; but the herd had been on the farm for a long time, and it was not known that any of them had been in contact with or infected by cattle from abroad. To make the matter certain, one of the sickest cows was appraised and slaughtered. Both lungs of the animal were found packed and solidified with tubercles; but there was an entire absence of those peculiar tissue characteristics always found in the contagious form of lung disease. The facts elicited by careful inquiry respecting the history of the herd and its management satisfied the Commissioners that the disease was engendered on the premises. There were about forty animals in all, practically in one stable, and, except in the daytime in the summer season, they had little exercise in the open air. Throughout the cold portion of the year the stable was closed front and rear; the barn doors were shut at all times; and in the coldest weather the temperature of the stable was maintained at between sixty and seventy degrees, and practically no ventilation provided. In all other respects the herd was cared for in the best manner; but in the opinion of the Board proper sanitary conditions had been systematically disregarded for a long time, and this was a sufficient cause for the condition of the herd. The fact that this disease had been found in three

or four isolated localities within the last year has been the occasion of much excitement and alarm by sensational statements of its contagiousness. That it is so, the best authorities are not agreed. Youatt in his work on cattle, published in 1840, says: "Animals which exhibit decided symptoms of consumption should be removed from the dairy, not because the disease is contagious, but because it is undeniably hereditary." Recent experiments have been made to test the contagiousness of tuberculosis, both by inoculation and the ingestion of tuberculous matter; and Fleming says: "The facts elicited affirm that it may be thus communicated." Several investigators in this direction have failed to produce corroborating results, and others say that no results have yet been reached of any value in this direction.

The question of the contagiousness and virulence of tuberculosis is still under consideration, and further researches are necessary to elucidate and establish certain important points respecting it. We have, therefore, declined to consider it within the intent of the law which prescribes our duties and obligations. During the excitement occasioned by the supposed prevalence of this disease, a report reached the Board of Agriculture that the cattle on the Agricultural College farm at Amherst were infected with it, and the members, in their capacity as overseers of the college, passed a resolve requesting the Commissioners to make a careful examination of the stock and its condition. Complying with this request, Dr. E. F. Thayer, the veterinarian of the Board, made the examination, and reported to the overseers that "the appearance of the animals, without exception, was that of perfect health. Not one could be found that required physical examination; percussion and auscultation were tried on one without eliciting other than a normal and healthy condition.

This portion of the Cattle Commissioners' report for 1880 is here given in detail because it seems to be the first official recognition of, or a declination to recognize, tuberculosis among cattle in Massachusetts, and this communication from the Cattle Commissioners was in reality the result of Dr. Cressy's agitation of the matter during the previous winter.

The late Professor Stockbridge, and also the late Dr. Josiah H. Stickney of Boston, have informed the writer that during the campaign against contagious pleuropneumonia in 1860–66 occasionally cases of bovine tuberculosis were met with, but little attention was given to them; the Cattle Commission was stamping out contagious pleuropneumonia, and this disease

was not contagious pleuropneumonia, was not known to be contagious, and therefore little thought was given to the few cases met with.

In their report to the Legislature dated January 10, 1882, the Cattle Commissioners, speaking of lung diseases in connection with contagious pleuropneumonia, write as follows: —

> Inflammation of the lungs or tuberculosis may be engendered in the stock of any farm by undue exposure, want of ventilation or confinement in damp and filthy enclosures. But contagious pleuropneumonia, which has symptoms resembling those diseases, is the result of contact with an animal possessing the infection, or with some object he has infected, and is disseminated from animal to animal, like smallpox or measles in the human family. The appearance of lung disease on remote and isolated farms, unless it can be traced to contact with animals from abroad, should cause no alarm, but should prompt the owners to a careful hygienic examination of their premises, and methods of stock management.

There is no further mention of bovine tuberculosis by the Massachusetts Cattle Commissioners in their reports for four years, but a lecture was read at the public winter meeting of the State Board of Agriculture, at Framingham, in December, 1885, upon "Tuberculosis in Cattle," prepared by Dr. Frank S. Billings of Boston. Dr. Billings was, unfortunately, not present to deliver it in person, hence there was little discussion of the paper. As this lecture was given after the discovery of the tubercle bacillus by Koch it was more in accordance with modern ideas than the statements in the former reports of the Cattle Commission. Space will not permit a résumé of this paper, but it can be found in the report of the secretary of the Massachusetts State Board of Agriculture for 1885.

In June, 1885, the personnel of the Massachusetts Board of Cattle Commissioners was changed; Dr. Thayer and Mr. Jordan retired and Mr. A. W. Cheever, agricultural editor of the "New England Farmer," and Dr. J. F. Winchester, a young veterinarian of Lawrence and a graduate of the Massachusetts Agricultural

College, were appointed to replace them. Professor Stockbridge was continued in office.

At a special meeting of the State Board of Agriculture, held at the town hall at Barre, Mass., November 29, 1886, called at the request of the Cattle Commissioners, Dr. Winchester addressed the meeting, calling attention to the presence of bovine tuberculosis in the State, its hereditary nature, transmissibility and insidiousness, the difficulty of diagnosis, and his inability to assist owners of infected herds under existing laws. He was followed by Professor Stockbridge, who stated that the Board of Cattle Commissioners had long known of the existence of bovine tuberculosis in Massachusetts, but that the veterinary colleges had never agreed upon the question as to whether it is contagious or not. "There has been a long and acrimonious dispute in relation to it, and the consequence has been that the Cattle Commissioners have never recognized it or treated it as a contagious disease." After considerable discussion it was decided that if additional legislation regarding it were necessary, the Cattle Commissioners were the ones to recommend it to the Legislature and to attempt to procure it. The Cattle Commission in its report to the Legislature, January 7, 1887, refers to tuberculosis among cattle, its nature and dangers, and in conclusion says: —

> Notwithstanding all that is certainly known of the disease and the great losses it entails, yet it is surrounded with such obscurity and uncertainty, and presents such apparently insurmountable obstacles to its eradication, that we have made no direct attempts to combat it; but some of our citizens, to rid their herds and premises of the pest, have, during the past year, destroyed many thousands of dollars' worth of cattle.

If the Cattle Commission made any attempt this year to obtain legislation on bovine tuberculosis nothing came of it. In their report of January 6, 1888, for the year 1887, the Cattle Commissioners again speak of the prevalence of tuberculosis among cattle,

its peculiarities and the difficulty of eradicating it "by force of our present statutes or any appropriation the Legislature would make." It says the disease prevails to about the extent of the previous year, but suggests that as the veterinary profession increases in number "attention is called to it more and more, and there is a call for more active work."

In the report of the Cattle Commission of January 7, 1889, for the year 1888, there is a special report by Dr. J. F. Winchester upon tuberculosis, showing by tables its prevalence and losses in certain herds to which his attention had been called. In 1889 Dr. Winchester's term expired and the late O. B. Hadwin of Worcester was appointed to the vacancy. Bovine tuberculosis is briefly referred to in the report for that year, and it is stated that: —

> Should the disease materially increase in those sections of the State where milk is produced for town or city markets, as a measure to guard the public health it may become the duty of the Commissioners or of local boards of health to cause the inspection of herds producing market milk, and the removal therefrom of all animals exhibiting the slightest symptoms of this disease.

Messrs. Stockbridge, Cheever and Hadwin continued on the Board of Cattle Commissioners until the spring of 1892, and as the public interest had now been thoroughly aroused on the question, their reports for 1890 and 1891 give the subject a certain amount of consideration, although the position taken is rather one of not unduly alarming the public or of exaggerating the danger.

In the report for 1890 it is stated, in reference to tuberculosis: —

> Careful observation during the past year fails to convince us that this disease is becoming more prevalent; but the published experiments of sundry investigators, the zeal of veterinarians for the public welfare or their own personal interests, have pointed out the methods by which it is propagated, and newspaper reporters have aroused public attention to the matter by sensational or erroneous reports of a very few special cases. The disease has been here ever since white men or cattle occupied the land.

The report for 1891 exhibits considerable ire against the State of Maine for prohibiting the shipment within her borders of neat cattle from Massachusetts because of the prevalence of bovine tuberculosis within the latter Commonwealth, and remarks that the action of Dr. George H. Bailey, veterinarian to the Maine Cattle Commission, is unconstitutional, and quotes a decision of the United States Supreme Court in support of this view in reference to Missouri forbidding bringing cattle infected with Texas fever within her limits, "because it attempted to interdict or control commerce between the States, which was a power conferred by the Constitution only upon Congress." Since then there have been other opinions of the United States Supreme Court, that a State can take measures to protect itself from the introduction of a disease that may endanger the health of its people or live stock.

Late in 1886 or early in the winter of 1887 the writer of this chapter, who was at that time investigating contagious bovine abortion for the Massachusetts Society for Promoting Agriculture, remarked to the late Ebenezer Francis Bowditch of Framingham, one of the trustees of the society, that it would be very interesting to investigate the danger from the use of milk from a tuberculous cow. While it was generally conceded that a cow with tuberculous udder gave off tubercle bacilli in the milk, it was suggested that an investigation to show how slightly diseased a cow might be and yet be dangerous might be of value. The trustees of the society decided that such an investigation would be of value, and determined to undertake the work. The writer, while he was the society's veterinarian, advised that in order to make the results of the work carry the greatest possible amount of weight the services of a man who had already made a name as a scientist, and whose signature to a report would secure immediate recognition, should be secured to direct the experiments and prepare a report of the results. The services of Dr. Harold C. Ernst of Boston, Professor

of Bacteriology at the Harvard Medical School, were secured for this purpose. A committee of the trustees of the Society for Promoting Agriculture, consisting of the late Thomas Motley, its president, the late E. F. Bowditch, the late Jacob C. Rogers, and Gen. Francis Henry Appleton, was appointed to have charge of the work.

A farm was rented at Mattapan, a suburb of Boston, as an experiment station, in the spring of 1887, where a herd of tuberculous cows was kept for over three years, and feeding and inoculation experiments conducted and bacteriological examinations of the milk and cream made at the Harvard Medical School. Dr. Ernst supervised much of the work and wrote the report, but a great deal of the actual work was performed by Dr. Henry Jackson, Dr. Langdon Frothingham and the writer of this chapter. A report of the results of these researches was presented to the trustees of the society in the autumn of 1890, and was later published in book form at its expense under the title of "Infectiousness of Milk."

It was found that milk from a herd of tuberculous cows contained tubercle bacilli, as demonstrated by both microscopical examination and inoculation experiments, and that milk from these cattle was capable of producing tuberculosis in calves and pigs fed upon it in from 33 to 50 per cent. of cases. Milk-feeding experiments were tried on rabbits, but with much less positive results, due no doubt to the fact that these little animals drink proportionately less milk than calves and pigs. Examinations made of city milk taken in Boston and Lowell, and inoculation experiments tried on rabbits, showed it to be infected in a few instances.

Beside the results of the experiments at Mattapan and examinations of milkmen's milk the report contains a voluminous correspondence, elicited by letters written by Dr. Ernst asking the views of members of the veterinary and medical professions on the infectiousness of milk, and reports from veterinarians upon the prev-

alence of bovine tuberculosis in various localities. Dr. Ernst concludes the report as follows: —

I have presented, in the preceding pages, the evidence that we have been able to collect upon the points in regard to which information seemed to be especially needed. This evidence is sufficient, it appears to me, to warrant certain definite conclusions, as follows: —

1. While the transmission of tuberculosis by milk is probably not the most important means by which the disease is propagated, it is something to be guarded against most carefully.

2. The possibility of milk from tuberculous udders containing the infectious element is undeniable.

3. With the evidence here presented, it is equally undeniable that milk from diseased cows with no appreciable lesion of the udder may, and frequently does, contain the bacillus of this disease.

4. Therefore all such milk should be condemned for food.

The Massachusetts Society for Promoting Agriculture presented the results of these investigations to the Legislature of 1891, on January 13, by petition asking for legislation to secure an inspection of cattle in Massachusetts. After a delay of several months the Legislature passed the following: —

Chapter 118, Resolves of 1891.

Resolve providing for an investigation by the state board of agriculture into the dangers arising from tuberculosis in the food products of cattle.

Resolved, That the State board of agriculture be instructed to investigate and ascertain the best methods to be adopted in order to protect the citizens of this Commonwealth against the dangers to human life and health which may arise from the presence of tuberculosis in the food products of cattle, with power to employ expert assistance, and report in print the result of their investigations to the next general court, with such recommendations as they may deem advisable. And for the purpose aforesaid they may expend such sum, not exceeding twenty-five hundred dollars, as they may deem necessary, which sum shall be allowed and paid out of the treasury of the Commonwealth. [*Approved June* 11, 1891.

The appropriation provided was much less than was recommended, and was so small as to negative the purpose of the resolve,

as shown by the following report of the State Board of Agriculture to the Legislature of 1892: —

In compliance with the requirements of the foregoing resolve the State Board of Agriculture begs leave to submit the following report: —

This resolve seems to look to a report on two distinct subjects: first, as to the danger to human life and health from the food products of cattle; and second, as to how best to protect the public from such danger.

First. Much attention has been bestowed by scientists on this branch of the subject, and many thousands of dollars by individuals, institutions and societies in investigation. The Massachusetts Society for the Promotion of Agriculture has expended a large sum in experiments to prove how great is the danger to human life and health from the use of milk of tuberculous cows. The results of these experiments were made known to the Legislature of 1891, as were also the discoveries of other scientists in our own and foreign countries. In view of the results of the experiments obtained at such large expense, the State Board of Agriculture believes that any further experiments and investigations that could possibly be made with the sum appropriated ($2,500) could throw very little light upon the subject. For this reason no expense has been incurred. That there is danger to human life and health in the food products of animals affected by this disease seems to be a proved fact. There is also danger to the life and health of our domestic animals, arising from the presence of these diseased animals among them. How great the danger is depends upon the proportion which the number of tuberculous animals bears to the number of those in health. It must not be forgotten that the danger to life and health is not alone from food products. Many investigators believe that the greatest danger is from the germs of the disease floating in the air. These germs come from the dried sputa reduced to powder. The same danger comes from the presence of human beings affected with the disease. Many alarmists have stated that the proportion of tuberculous cattle is very large, — some place it as high as 25 per cent. of the whole number in our State. However, careful estimates from all sources of information show that the percentage of tuberculous animals is very much less than that figure, probably not more than 3 or 4 per cent. It is known that the cattle of all countries are subject to this disease, and have been so subject for thousands of years; but it is only recently that it has been recognized as the same as consumption in man. It is not believed that the proportion of infected cattle in Massachusetts is much greater than in other thickly populated countries.

Second. How best to protect the public against the danger to human life and health, arising from the presence of tuberculosis in the food products of cattle. As there is danger, it is highly proper that the Legislature should provide for reducing the danger to a minimum. The trade brings large numbers of cattle from other States into Massachusetts, and there is always a likelihood of infected cattle

being brought in. Cattle are always liable to get the disease from consumptive attendants. Consequently we cannot hope to eradicate this disease from among our cattle. So long as the human family suffer from it our cattle will be liable to it; but it may be reduced to a minimum. The meat of cattle affected with this disease should not be used for food; the milk from tuberculous cattle should not be sold in the market; it is not safe to breed from such animals, and they are consequently worthless. The owners of such animals would only be too glad to be rid of them were they prevented from selling their food products, and if it were not for the possibility of selling the animal to some one who was not aware of its condition. So the only value a tuberculous animal can have is from the possibility of imposing upon some one by the sale of unhealthy food products or worthless animals. Thus the practical solution of the problem seems to be to find means to prevent the trade in such cattle. Many of the milk farmers of the eastern portion of the State, where all admit tuberculosis to be the most prevalent, procure their cows at the Brighton and Watertown markets. There are gathered for sale the surplus cows of western Massachusetts, Vermont, New Hampshire and Maine, as well as many from New York and farther west. A law providing for the inspection of all cattle sold in these markets by a state inspector is recommended. Along with this provision should go an amendment to the contagious disease law, requiring the Cattle Commission to order the slaughter and burial, without appraisement, of animals found to be infected with tuberculosis, in the same manner in which glandered horses are disposed of. Provision should be made for a post-mortem examination of all cattle thus slaughtered, sufficiently thorough to determine whether or not they were tuberculous, and in case the post-mortem failed to show the presence of the disease, provision should be made for remuneration to the owner for the damage suffered.

While the above includes all that the Board desires to recommend, if further provision be deemed advisable it is suggested that state inspectors might be appointed in different parts of the State, not less than one to each county, whose duty it should be to examine neat cattle on application from the owner, party desiring to purchase, or town or city authorities, and give certificates that such animals were free from tuberculosis when the examination warranted. Provision should be made for the pay of such inspectors from the State treasury per diem for the time spent, or by a stated sum per head of cattle examined. In order to make the work of these inspectors most effectual, they should be appointed by and work under the direction of the Cattle Commissioners.

The above report is thus given in full because many of the recommendations made in it were incorporated into law by the Legislature of 1892, and have continued in force, with occasional modifications, until the present time. Primarily to the Massa-

chusetts Society for Promoting Agriculture belongs the honor of bringing to public attention the prevalence of bovine tuberculosis, and the dangers from the use of meat and milk from tuberculous animals, and it largely deserves the credit for final legislative action. The Massachusetts Legislature of 1892, ten years after the discovery by Koch of the tubercle bacillus, declared tuberculosis to be one of the contagious diseases of animals recognized by the statutes of the Commonwealth, and provided for the killing of diseased cattle without appraisal or payment. It also made the law providing for the appointment of inspectors of animals in the various cities and towns of the State mandatory; prior to this it had been permissive since 1876, but only a few municipalities had availed themselves of it. Later the law was amended to provide that these appointments should be subject to the approval of the Cattle Commissioners; it also provided that the Board of Cattle Commissioners could appoint inspectors of animals where cities or towns refused or neglected to do so, and that they could remove inspectors for incompetency or just cause. In 1893 the Legislature also enacted a law providing a penalty for any city or town that refused or neglected to appoint an inspector or inspectors of animals and provisions. In 1908 the Legislature passed a law that one of the inspectors of animals annually appointed in cities shall hereafter be a registered veterinary surgeon. As a matter of fact nearly all the cities and larger towns already had veterinarians for inspectors of animals.

In the spring of 1892, at the request of Gov. Wm. E. Russell, the Cattle Commissioners, Messrs. Stockbridge, Cheever and Hadwin, resigned, and the Governor reappointed Professor Stockbridge, and named to serve with him two veterinarians, Dr. Charles P. Lyman, Dean of the Faculty of the Harvard Veterinary School, and Dr. Maurice O'Connell, a veterinarian living in Holyoke, who qualified May 12 and immediately entered upon the dis-

charge of their duties. During their first year in office eighty-one head of tuberculous cattle were killed without appraisal or payment.

The Cattle Commission of three members continued as above until June, 1894, when the Board was increased to five; owing to the increasing interest in bovine tuberculosis, and the demand for a greater amount of work, it was decided that three men were not sufficient and that the Board ought to be larger. Dr. Frederick H. Osgood, a professor at the Harvard Veterinary School, and Leander F. Herrick of Worcester were appointed. The act of the Legislature increasing the Commission to five members also provided that one-half the value of neat cattle killed as tuberculous by state authority shall be paid by the Commonwealth, the appraisal to be based on the value of the animals for food or milk. In October, 1894, Charles A. Dennen of Pepperell was appointed a member of the Board, to fill the vacancy caused by the retirement of Professor Stockbridge, after twenty-seven years' service, who resigned at the end of his term of office.

In September, 1894, the Board of Cattle Commissioners first introduced the use of tuberculin as a method of diagnosis, and immediately instituted its use upon a large scale. The tuberculin test was applied to all the cattle quarantined on suspicion by the local inspectors of animals, also upon cattle brought into Massachusetts from adjoining States, and a systematic testing of entire herds was undertaken, the Commissioners stating that it was their intention to test all the herds in the State and kill reacting animals, starting in the southeast corner. This season the entire bovine population of Nantucket Island was tested, only .9 per cent. of the cattle reacting.

The assertion that the Commission intended a compulsory test of all the cattle in the State aroused a great deal of opposition in some quarters. During the autumn the local inspectors quaran-

tined 3,295 cattle on suspicion of being affected with tuberculosis, of which eight hundred and ten were found to be tuberculous by means of the tuberculin test and killed; 1,432 head were tested at Brighton, of which eighty-nine, or 6.21 per cent., were killed and found tuberculous, but there were also twenty-one killed in which no lesions were found. Of six hundred and sixty-five tested on Nantucket, only six reacted, and the lesions in some of these were so slight as to be questionable.

During 1895 the personnel of the Commission remained as it was in October, 1894, after the appointment of Mr. Dennen, and the policy adopted the previous autumn continued unchanged in most respects. The payment of half compensation for tuberculous neat cattle destroyed was found to be unsatisfactory to the farmers, and the law was changed to allow the full appraised value for each animal killed, not exceeding sixty dollars for any one creature, provided the condemned animal had been owned in the Commonwealth for six consecutive months prior to the date of condemnation.

The Cattle Commission continued to test all cattle brought to Brighton, Watertown and Somerville stock yards from without the State, and also all Massachusetts cattle offered for sale at these markets, except beeves for immediate slaughter, calves under six months old and cattle intended for export, until April 30, when the work was relinquished for lack of funds.

In July an order was adopted that cattle could be brought in from without the State on permits issued by the Board, except to the stock yards at Brighton, Watertown and Somerville, where they could be brought without permits, as these yards were considered quarantine stations, and cattle accompanied by satisfactory certificates of tuberculin test, made by veterinarians in other States approved by the Board, were released. This method continued for several years, and soon became a farce and fraud

upon the public, as much of the work was done dishonestly, to please the cattle dealers, particularly for the drovers attending the weekly market for milch cows at Brighton.

The systematic testing of herds started in Nantucket the previous year was continued, and completed in Dukes (the island of Martha's Vineyard) and Barnstable counties, including 2,856 animals, of which nine reacted to tuberculin and were killed and found to be tuberculous. In addition, seven hundred and ninety-five head were condemned as tuberculous that were quarantined by the local inspectors.

The Cattle Commission continued in 1896 as organized in October, 1894, with Dr. Osgood as chairman and Dr. Lyman as secretary, until October.

The Commission's position on tuberculosis was very radical and expensive. The inspectors of animals during the first half of the year, before an appropriation was made for the year's work, continued to quarantine cattle on suspicion of having tuberculosis, and the law provided that after ten days from the date each animal was quarantined the State should assume the expense, and the Commission would not kill any until an appropriation was made. The result was that when the Legislature made an appropriation, early in June, there were 1,043 head of neat cattle in quarantine, upon which the State owed a board bill of $28,223.43, nearly as much as the appraised value of the animals in quarantine.

The avowed intention of the Board of Cattle Commissioners to enforce a compulsory tuberculin test of all the neat cattle in the State aroused a great deal of opposition among the farmers. Tuberculin was a new agent, and as such could not be forced upon cattle owners until more was known about it by them, as many statements were in circulation concerning injurious effects produced by it, such as causing tuberculosis in healthy cattle, abortion and the like; furthermore, many owners of cattle were unable to

comprehend that an animal with a nodule or two in a bronchial or mediastinal gland was a source of danger to other cattle or to human life, or that the flesh of such an animal was unhealthful for human food. As the result of this opposition Dr. John M. Parker of Haverhill was appointed a member of the Board by Governor Wolcott, at the expiration of Dr. Lyman's term of office, in October, 1896.

In December Dr. F. H. Osgood resigned and Dr. Austin Peters of Boston was appointed to fill the vacancy, and elected chairman, with Dr. Parker as secretary. The excitement over bovine tuberculosis reached high-water mark in 1896, when the Legislature appropriated $300,000 for the use of the Cattle Commission. Early in the winter of 1897 an appropriation of $250,000 was secured for the eradication of contagious disease among animals. During the spring of 1897 many farmers in Middlesex County had their herds tested by veterinarians, at their own expense, and the veterinarians reported reacting animals to the Cattle Commissioners, who had the animals appraised and killed. This led to a raid on the appropriation as a result of tests made on cattle over which the Commission had no control.

Another extravagant feature of the law then in force was that animals killed as diseased were deemed unfit for food, and hundreds of animals were thrown into the rendering tank and made into fertilizer, which, under an intelligent system of meat inspection, might have been passed as fit for beef.

The farmers who had the testing done in most cases had no interest in an attempt to diminish the amount of bovine tuberculosis in the State, but simply did it as a matter of speculation, with the idea of selling a lot of old milked-out cows to the Commonwealth for more than they were worth. In this they were disappointed to a certain extent, as more cows reacted than the owners expected, and also in many instances the best ones, so as to almost wipe out entire herds. This condition of affairs attracted the attention of

certain members of the Legislature, and resulted in the appointment of a special joint committee, April 9, 1897, to investigate the work of the Cattle Commission, with power to employ experts to make autopsies on the cattle from certain herds in Dracut, condemned after private tests made by veterinarians, the committee to report to the Legislature later.

The committee selected as experts to make autopsies on condemned cattle, and also the few remaining non-reacting cattle in certain herds, Harold C. Ernst, M.D., of Boston, Theobald Smith, M.D., of Boston, George N. Kinnell, M.R.C.V.S., of Pittsfield, Dr. Frank Billings of Grafton, a graduate of a German veterinary school, and Charles R. Wood, veterinary surgeon, of Lowell. Each wrote an independent report.

The legislative committee from the Senate and House reported May 25, 1897. There were two reports, one signed by most of the members, and a minority report, signed by two members of the House. The majority report favored more conservative methods, stated that the Cattle Commission should pay more attention to disinfecting barns and stables where tuberculous animals had been kept, immediately upon their removal, and before new animals were introduced. The majority report continued as follows: —

From our observations at the investigation we hold that the Board of Cattle Commissioners should at once take into consideration modifications of the law relative to the condemnation of cattle by tuberculin test alone, that is, upon the request of owners of cattle for such testing of their herds. If cattle are to be condemned or regarded as suspicious animals only after they show signs of disease, it is a question as to the propriety or equity of the State paying full value for those that are actually diseased. This proposition we respectfully refer to the consideration of the next General Court, trusting that the Board of Cattle Commissioners will, in the meantime, consider the same question and offer recommendations in their annual report.

We believe that the Legislature should at once deal with the matter of indiscriminate tuberculin tests. We recommend that all testing of cattle with tuberculin when compensation is expected be limited to the Cattle Commissioners or their authorized agents. The Board of Cattle Commissioners have already expended more than $160,000 of the total appropriation of $250,000, made earlier in the

session. If they are compelled to kill all reacting animals and allow full compensation for the diseased cattle the remainder of the appropriation will soon be exhausted. There will then be no money for the prosecution of the regular work of the Commission or the slaughter of those animals reported by the local inspectors as suspicious cases, and which are really the most dangerous animals to the health and comfort of the general public. The Commissioners are not allowed to exceed their appropriation, hence all their work must stop when their money gives out.

We earnestly recommend the immediate passage of the following act: —

COMMONWEALTH OF MASSACHUSETTS.

In the Year One Thousand Eight Hundred and Ninety-seven.

AN ACT RELATIVE TO THE PAYMENT OF COMPENSATION FROM THE STATE TREASURY ON ACCOUNT OF CATTLE INFECTED WITH TUBERCULOSIS.

Be it enacted by the Senate and House of Representatives in General Court assembled, and by the authority of the same, as follows:

SECTION 1. No person or persons having animals tested with tuberculin shall be entitled to compensation from the state for any animals that react to the tuberculin test unless such testing be done by the state board of cattle commissioners or their authorized agents acting as such at the time of the test, and such testing must be subject to the supervision and control of the state board of cattle commissioners.

SECTION 2. This act shall take effect upon its passage.

We submit with this report the reports made by the experts attending the post-mortem examinations of these cattle.

The above proposed legislation was immediately acted upon, and became law June 10, 1897, insuring a complete control of its appropriations to the Cattle Commission in the future. The Legislature had already earlier in the season passed an act restricting the use of tuberculin, which provided as follows: —

The use of tuberculin as a diagnostic agent for the detection of the disease known as tuberculosis in domestic animals shall be restricted to cattle brought into the Commonwealth from any point without its limits, and to all cattle at Brighton, Watertown and Somerville: *provided, however*, that tuberculin may be used as such diagnostic agent on any animal or animals in any other portion of the State upon the consent in writing of the owner or person in possession thereof, and upon any animals condemned as tuberculous upon a physical examination by a competent veterinarian.

This was approved March 17, 1897. This clause in the law was first enacted in April, 1896, to continue in force until June 1, 1897,

but in March, 1897, it was made permanent upon the statute book. This was due to the opposition of the farmers to the unrestricted compulsory use of tuberculin by the Cattle Commission.

The minority report of the committee favored continued radical action, and considered that if the Cattle Commissioners had made mistakes the fault was with them, and not with the law.

In 1898 the Legislature gave the Cattle Commissioners "power to make and issue rules and regulations for the guidance of inspectors of animals and provisions in the inspection of meat, which shall conform with the rules and regulations of the United States Bureau of Animal Industry for the inspection of meat for export and for interstate commerce." This was approved May 23, 1898. This put an end to the folly and extravagance of making fertilizer out of meat fit for food. The Legislature of 1898 appropriated only $20,000 for the use of the Cattle Commission. Governor Wolcott called the attention of the Legislature to the fact that this appropriation was insufficient to carry out existing laws, and the House then voted to abolish the Cattle Commission, in which, however, the Senate refused to concur. The Governor then again wrote the Legislature a message, recommending a further appropriation. The House again voted to abolish the Cattle Commission; the Senate again stood by it. The Commissioners decided to do what they could as individuals during the remainder of the year, and in this way examined and caused to be killed glandered horses, and kept up the quarantine against out-of-the-state cattle, requiring all those brought in to have certificates of tuberculin tests, except beeves for immediate slaughter or calves under six months old. The Legislature of 1899 passed a deficiency appropriation bill sufficient to pay the members of the Commission the arrears in their salaries.

The Legislature of 1899 also passed an act recodifying the laws

relating to contagious animal diseases, reducing the Cattle Commission from five members to three, and giving it an appropriation of $75,000 for the current year. The limit of value on a bovine with tuberculosis was reduced from $60 to $40, and the law providing for the annual appointment of inspectors of animals and provisions by the various cities and towns of the State was changed to provide for the annual appointment of inspectors of animals. The inspection of live animals at the time of slaughter and provisions was turned over to the local boards of health, the inspectors of animals only having to inspect live animals for contagious diseases, quarantine suspected cases, and make a general inspection of farm animals and premises where they are kept when ordered to do so by the Cattle Commission, which has been ordered annually in the autumn since 1899. This act was approved May 25, 1899, and Governor Wolcott appointed Charles A. Dennen, Leander F. Herrick and Dr. Austin Peters members of the Board.

The Commission continued thus until 1902, when, at the suggestion of Gov. W. Murray Crane, who thought that the State had too many commissions, the Legislature abolished the Board of Cattle Commissioners and established in its stead a Cattle Bureau of the State Board of Agriculture, with a chief appointed annually by the Governor with the advice and consent of the honorable Executive Council, who, by virtue of his office, shall be a member of the State Board of Agriculture. The Governor then appointed Dr. Austin Peters chief of the Cattle Bureau. As there is no one in the Cattle Bureau except the chief, who has the powers and duties formerly vested in the Cattle Commission, it practically replaces a commission of three with a single commissioner. This arrangement has remained in force since April, 1902.

During the winter of 1902–03 the market at Brighton was closed because of an outbreak of foot-and-mouth disease, but

since it was reopened in July of the latter year all out-of-the-state cattle brought to Brighton, Watertown and Somerville for the weekly market upon which a test is required have been tested by the agent of the Cattle Bureau in charge of these yards, and his assistants, as it was found that much of the testing outside of the State, which was done by the veterinarians for the drovers, was not honestly performed, and the certificates in many instances were of no value. About thirteen or fourteen thousand cattle, chiefly milch cows, are tested at the Brighton barn each year, and reacting animals, about two hundred usually, are killed. Recently it has been decided not to accept any certificates of test from veterinarians outside of the State on cattle coming in on permits to points outside of the stock yards at Brighton, Watertown and Somerville, but to have all cattle upon which a test is required tested after arrival at their destinations by agents of the Cattle Bureau. These tests are made free of charge to citizens of Massachusetts, and at cost to others, as required by chapter 332 of the Acts of 1903.

The following shows the amounts appropriated for the use of the Cattle Commission or Cattle Bureau since 1895, and the number of cattle killed: —

YEAR.	Amount appropriated.	Number of Cattle killed.	Amount paid for Cattle.
1896,	$300,000 00	5,748	$189,216 60
1897,	250,000 00	5,529	188,534 00
1898,	20,000 00	297	8,057 61
1899,	75,000 00	785	17,277 69
1900,	50,000 00	1,423	30,870 22
1901,	50,000 00 3,408 11[1]	1,341	27,424 50
1902,	58,000 00	1,001	21,137 75
1903,	73,000 00 4,500 00[1] 40,000 00[2]	1,843	42,454 32

[1] Deficit appropriation. [2] Additional appropriation, foot-and-mouth disease.

YEAR.	Amount appropriated.	Number of Cattle killed.	Amount paid for Cattle.
1904,	$65,000 00 9,500 00[1]	1,658	$35,456 45
1905,	67,000 00 5,000 00[1]	1,625	34,133 58
1906,	66,416 66 11,560 24	1,737	35,952 75
1907,	77,000 00 8,432 60[1]	2,030	42,326 60
Totals,	$1,233,817 61	25,017	$672,842 07

It will be seen by the foregoing table that for the twelve years ending December 1, 1907, the State of Massachusetts has appropriated the sum of $1,233,817.61 for the eradication and control of contagious diseases among domestic animals, and that a large item of expense is the cost of paying owners of tuberculous animals for neat cattle slaughtered by the state authority as suffering from this disease. During twelve years 25,017 head of tuberculous cattle have been killed, for which the State has paid $672,842.07, an average of $26.89 per head.

It is also shown how the pendulum has swung one way and then the other; that in 1896 the limit was reached when $300,000 was appropriated, and in two years the Legislature went to the other extreme and appropriated but $20,000, and that the House then voted to abolish the Cattle Commission; how later an even keel was reached, and since then the appropriation has ranged from $50,000 to $75,000 per year. The combined appropriations for the years 1896 and 1897 were nearly half of the sum of the appropriations for the twelve years, and $377,750.60 was paid for 11,277 diseased cattle in 1896–97, which is more than half of the sum total paid for 25,017 head.

The average price paid per head for condemned animals in 1897

[1] Deficit appropriation.

was a little over $34, which was the maximum average price per head reached; since then it has been diminished, until the last few years the average price paid per animal has been between $20 and $21. The reason for the high prices paid in 1896–97 was due to the fact that all animals quarantined by the local inspectors and many large herds were tested with tuberculin, and all reacting animals killed, no matter how slightly diseased they might be, and many of these animals were apparently in good physical condition, while at the present time only animals that show marked physical evidence of disease, or that have nodulated udders, are killed, and nearly all are condemned on a physical examination. In 1896–97 there must have been, counting private tests, fully ten thousand head of cattle tested with tuberculin in each year, over half of which reacted, and were killed and found to be diseased.

The present methods give the State a tolerably good system of dairy inspection as far as protecting the public health from the milk of tuberculous cows in Massachusetts is concerned, but it does not protect them from the milk of tuberculous cows in Maine, New Hampshire, Vermont, Connecticut or New York State. While much has been done towards diminishing bovine tuberculosis in some of the adjoining States, notably Vermont, there are, on the other hand, localities from which milk is shipped into Massachusetts where the conditions are exceedingly bad.

It is doubtful if the work at present being carried on against bovine tuberculosis in Massachusetts accomplishes much in the direction of decreasing the percentage of tuberculosis among the herds of the State, as a fresh crop of badly diseased cattle, mostly cows, is harvested year after year; if anything, it would appear that there is a slight increase, as the number of condemned cattle has gradually increased a little, varying somewhat from year to year, from 1,423 in 1900 to 2,030 in 1907. To do more work and

gain greater headway, larger annual appropriations for the use of the Cattle Bureau will be needed. The greatest possible amount of work is being done with the means available at the present time. If public opinion demands more than is at present being done, there is no doubt but what the appropriations will be increased so as to allow more active and extensive measures being adopted for the eradication and control of bovine tuberculosis than are at present in force, but it is not at all likely that the Commonwealth of Massachusetts will ever return to annual appropriations for this purpose of from $250,000 to $300,000.

CHAPTER VI.

THE ORIGIN AND GROWTH OF THE SANATORIUM TREATMENT OF PULMONARY TUBERCULOSIS IN MASSACHUSETTS.

Vincent Y. Bowditch, M.D.

THE SHARON SANATORIUM AT SHARON.

The Sharon Sanatorium in Sharon, was the first institution of its kind in New England to be established in accordance with the ideas of Brehmer and Dettweiler in Germany and later of Trudeau in the Adirondack Mountains in New York State. In certain particulars the sanatorium was for several years unique. Previous to its establishment in 1890 it had been thought necessary to place such institutions at a comparatively high altitude, at considerable distance from the sea, and in climates less subject than the coast of New England to sudden changes of temperature and humidity. The idea that patients could be successfully treated not far from home had hitherto been thought, if not absolutely impossible, at least of such doubtful nature that the suggestion was at first regarded by many as almost chimerical.

In spite of this skeptical attitude on the part of both the medical profession and the laity, and following the teachings of the late Henry Ingersoll Bowditch, who for many years had constantly taught the value of fresh air as the most important feature in the treatment of pulmonary disease, an appeal was made to private citizens of Boston, and the sum of about $30,000 was raised. The town of Sharon, approximately eighteen miles from Boston and ten miles from the seacoast, was selected on account of its favorable situation on the watershed between Boston and Providence, and because of its porous soil and abundant supply of excellent

water. Through the bounty of a lady deeply interested in the plan, a small farm of twenty-three acres was bought, and upon a high knoll at an altitude of only about two hundred and fifty feet above sea level, sheltered by woods on the north, east and west, a commodious but simple building, suitable for nine patients and the administrative staff, was erected in the autumn of 1890. As necessary adjuncts to the sanatorium, a pumping engine and tank for the water supply were installed and a simple but thorough method of cesspool drainage was arranged, to be changed in later years to a perfected form of sewage filter-beds. The cost of these essentials for a sanatorium, in addition to a small amount of grading and road-making, amounted to about $20,000. The sum of $10,000 was therefore left for current expenses until the object and aims of the sanatorium should become generally known.

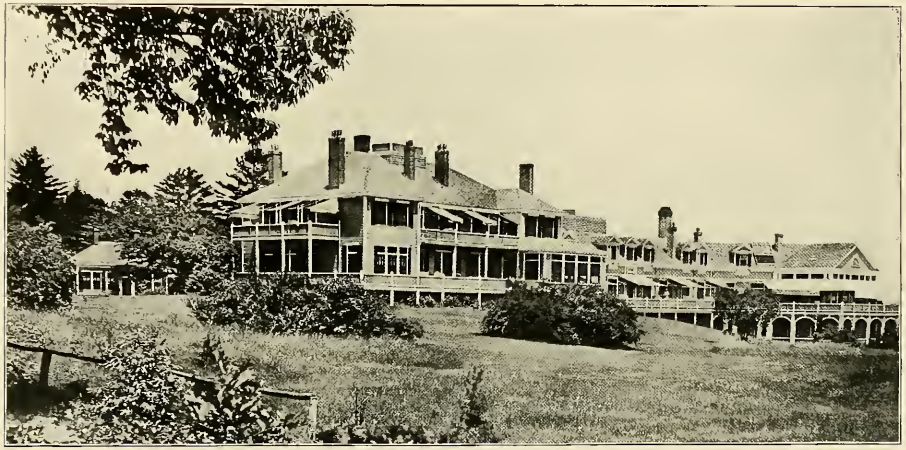
The institution was opened on the 9th of February, 1891, and the first patient was received on February 16. It was formally incorporated in March, 1891, with the legal title of the "Sharon Sanitarium." [1] The following directors and officers were elected: —

Board of Directors: Alfred Bowditch, President, N. H. Stone, Treasurer, Reginald Gray, L. Vernon Briggs, Miss Olivia Y. Bowditch, Miss Alice M. Curtis, Secretary, Miss M. H. Denny, Mrs. Horatio A. Lamb. Medical Directors: Vincent Y. Bowditch, M.D., Robert W. Lovett, M.D. Consulting Physicians: Henry I. Bowditch, M.D.,[2] Frederick I. Knight, M.D. Assistant Physician, John J. Moran, M. D. Matron, Mrs. M. E. Small.

As the sanatorium was intended only for women in the early stages of tuberculosis, of very limited means, a uniform charge of $5 a week, exclusive of personal laundry, was established. This sum included all medical services, medicines and board. The same charge is still adhered to, in spite of the great increase in the

[1] This name was legally changed in 1903 to "Sharon Sanatorium," as being the more correct and usually adopted title.

[2] Died in 1892.



SHARON SANATORIUM AT SHARON. — From the Southwest.

cost of living in the past few years, and in spite of the fact that the annual deficit is much larger than formerly.

The Sanatorium has been dependent chiefly upon the public for its support, and in consequence of certain bequests has made notable additions to its buildings. In 1897 a small infirmary was built not far from the main building, for the reception of patients who should become very ill, or in case of an outbreak of any acute infectious disease requiring absolute isolation. In 1900, by the bequest of Thomas T. Wyman, a large wing was added, providing separate rooms for ten patients, attic rooms for the servants, a large treatment room, and a heating plant in the basement. Between this wing and the infirmary, and connected by a subway, a cottage with apartments for the matron-superintendent and for the resident physician was also added. The capacity for patients has thus been increased during the past few years to twenty-three beds.

During the past year extensive but simple alterations have been made. Sleeping balconies have been added to the main building and wing, so that every bed can be rolled out at night, the patients sleeping in the open air under a canvas canopy even in the coldest winter weather. The dining-room has been much enlarged, with marked increase of light and air by the insertion of a larger number of windows than before.

To the small farm, upon which the buildings now stand, more than one hundred acres of beautiful woodland have been added to the property by gift and by purchase. By this the buildings are shielded from the harshest winds and the woods are being slowly developed as a park for the patients' use, the sale of timber being made a source of income to the sanatorium. A few acres of farm land are used for the production of vegetables sufficient for the patients' needs throughout the summer season, the supply of potatoes usually being sufficient for the whole year. Milk is obtained

from an excellent herd of cows on the Town Farm near by, which is in charge of an excellent Superintendent, the animals being occasionally examined by the State Inspector.

The cost per patient is one of the difficult problems of such an institution. All sanatoria of this nature are naturally comparatively expensive. If good results are to be obtained, a much larger outlay is required for provisions than in ordinary hospitals. The fact that a prolonged stay is necessary for each patient means that the surroundings must be attractive, though not necessarily luxurious, and entertainment must be afforded to relieve monotony as essentials in treatment. The class of patients received at Sharon is also a factor in the expense. People of refinement, even if of very limited means, naturally require more than the lowest class of the poor. All these considerations have to be taken into account in estimating the comparative cost of different institutions. The price of board thus far charged ($5 a week) barely covers one-third of the outlay, and in spite of earnest endeavor to use economy it has hitherto been impossible to lessen the expense per capita.

The number of people in the working staff of the sanatorium is as follows: a Superintendent and Matron (since May, 1901, Miss Alice R. Hodges), who has charge of the general administration and of the nurses; a Resident Physician (Dr. Walter A. Griffin since 1901), who, with the Medical Director, has charge of the medical department; two nurses; seven maids; and two men-of-all-work for the stable and farm.

The experiment has been tried in times past of employing the patients in the general work of the household; but for various reasons this has been found impracticable, chiefly because not only is it apt to interfere with the course of treatment, but because of the liability to illness, thus crippling the management. Each patient, however, is supposed to have the care of her own room, unless the physical condition contraindicates it.

SHARON SANATORIUM AT SHARON. — Sleeping Balcony.

The institution is free of any debt, but is in constant need of funds to supply the annual deficit. An Auxiliary Committee of ladies and gentlemen has been of invaluable service in adding large sums to the treasury by bazaars and other entertainments. An attempt is being made to establish an endowment fund, and thus far about $20,000 has been obtained for that purpose.

The results obtained at Sharon have long since shown that what was started as an experiment over seventeen years ago has justified the belief that much more can be done near the patients' homes than was thought possible a comparatively few years ago. Since the development of the method of fresh-air treatment, by which the patients are practically in the open air nearly every minute of the twenty-four hours, summer and winter, the results are even more satisfactory than in the earlier days, when less rigorous methods were in use. A few statements are appended, showing the results of treatment.

The Medical Report for March, 1907, prepared in accordance with the plan used by the National Association for the Study and Prevention of Tuberculosis, gives the following results: out of forty proven cases of tuberculosis treated during the year, nineteen were discharged "apparently cured," nine were discharged "arrested," ten were discharged "improved," two were discharged "progressive."

In a paper entitled "Subsequent Histories of One Hundred and Sixty 'Arrested Cases'[1] of Pulmonary Tuberculosis treated at the Sharon Sanatorium, 1891–1906," by Vincent Y. Bowditch, M.D., and Walter A. Griffin, M.D.,[2] the following facts are given: —

[1] This use of the term "arrested" is in accordance with the former method of nomenclature adopted at Sharon. It comprises all those cases who at the time of discharge were free of all abnormal outward symptoms of disease, viz., cough, sputa, fever, etc., the general aspect and condition being one of apparent good health. By this method, the term "cured" or even "apparently cured" is not used until, after a period usually of many months, the patient under ordinary conditions of life has shown no sign of relapse.

[2] Transactions American Climatological Association, 1907, printed in 1908.

Summary of the Total Number of "Arrested" Cases, 1891–1906 inclusive.

Total number "arrested,"	160
Number still living and well, most of them wage-earners or housekeepers, ...	133 = 83.0 + %
Number who have not recently been heard of, but who at last accounts were doing well, many of them in robust health, . .	6 = 3.7 %
Number who have since died, ...	21 = 13.0 + %

It should be added that, of those who died, the majority were advanced cases in which arrest of the disease was not expected. Two, at least, died from some cause other than tuberculosis, and others returned against advice to unhygienic surroundings, and relapsed.

The present list (1908) of Directors and Officers of the Sanatorium is as follows: —

Board of Directors: Prof. William T. Sedgwick, President, N. H. Stone, Treasurer, 614 Sears Building, Boston, Mrs. Charles A. Porter, Secretary, Augustus Hemenway, Rev. Edmund F. Merriam, Arthur Dehon Hill, Mrs. Henry P. King, Mrs. Wm. T. Sedgwick, Vincent Y. Bowditch, M.D., Robert W. Lovett, M.D., L. Vernon Briggs, M.D. Medical Director, Vincent Y. Bowditch, M.D. Consulting Physician, Frederick I. Knight, M.D. Resident Physician, Walter A. Griffin, M.D. Superintendent and Matron, Miss Alice R. Hodges.

THE STATE SANATORIUM AT RUTLAND.

On June 5, 1895, pursuant to the provisions of chapter 503 of the statutes of 1895 of the Massachusetts Legislature, a bill was approved for the establishment of a so-called "Massachusetts Hospital for Consumptives and Tubercular Patients," and a Board of five Trustees was appointed by the Governor and Council. This is the first instance in America of the foundation of a state institution for the treatment of tuberculosis.

The sum of $150,000 was appropriated for the purpose of purchasing suitable land and for the erection of buildings thereupon.

The Board of Trustees, composed of Fred B. Percy, M.D., of Brookline, Alfred Worcester, M.D., of Waltham, and Messrs. John C. Hammond of Northampton, A. W. Esleeck of Holyoke and W. E. Parkhurst of Clinton, held their first meeting for organization on August 15, 1895.

After much individual study of the question, and after obtaining the opinion of many physicians throughout the State as to the best location for such a hospital, a farm of about two hundred acres in Rutland, in Worcester County, fifty miles from Boston, at an elevation of about eleven hundred feet, was purchased, as having many of the essentials for the location of such a hospital, and buildings, planned by the architect, W. Chester Chase of Boston, were erected.

In December, 1897, the first report of the Trustees was issued. It speaks of the unforeseen difficulties of drainage and of laying out a long road to reach the Sanatorium, both requiring a larger outlay than was at first supposed. The drainage was carried through a rocky cut to the west of the hospital to a point about one mile distant onto lands six acres in extent acquired for the purpose of filtration beds. At the time of opening, therefore, no administration building had been put up, owing to lack of sufficient funds, and in consequence, the Superintendent was obliged to occupy a portion of the hospital intended for other purposes. This left a capacity of about one hundred and seventy-five beds for men and women, instead of two hundred as originally intended. The price of board and treatment was fixed at 50 cents a day ($3.50 a week). This price was not long afterwards raised to $4 a week, this being the present charge to all patients. At first no distinction was made as to race, creed or age, although

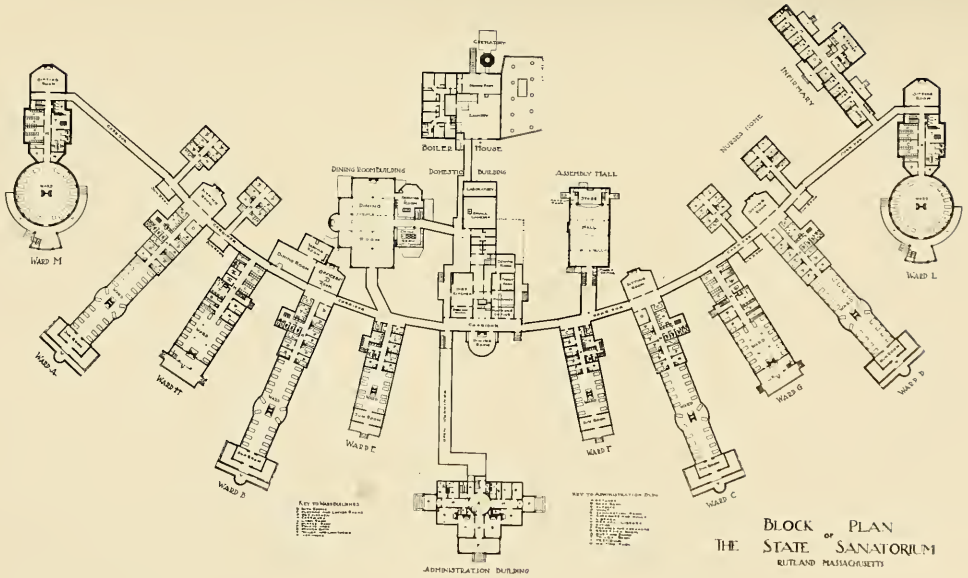
there was a somewhat tacit agreement that no child under twelve should be admitted.

At this time the question was mooted of changing the name of the institution and of converting its purpose from that of a hospital for advanced cases to that of a sanatorium for the treatment of incipient and moderately advanced cases. In the Trustees' report for 1898, the success obtained at the Sharon Sanatorium was cited as an instance of what could be done for the successful treatment of incipient tuberculosis in Massachusetts, and the decision was made to so change the original purpose of the bill as to make the institution a sanatorium for hopeful cases, rather than a hospital for advanced cases. The wisdom of the Trustees in making this decision can only be fully estimated when one realizes the intense interest which was soon shown by other communities throughout the United States, who have since followed the example of Massachusetts in erecting state sanatoria.

Two specialists on pulmonary diseases were chosen to act as attending physicians, who should represent respectively the regular and the homœopathic schools of medicine, in accordance with the terms of the original bill. Drs. Vincent Y. Bowditch and Herbert C. Clapp of Boston were selected to fill the positions. Their duties consisted in making weekly visits to Rutland; in taking full charge of the medical departments, with the privilege of having assistants who should reside in the hospital; and in making weekly examinations of applicants at the Boston office of the hospital.

On September 23, 1898, the hospital was formally opened by Governor Roger Wolcott. The first patient was received October 3, and Drs. Bowditch and Clapp began their service.

Dr. Walter J. Marcley had been previously chosen as Superintendent, and Miss Mary E. Thrasher as Matron. In 1900, by an



Block Plan of the State Sanatorium

Rutland Massachusetts

act of Legislature (statutes 1900, chapter 192), the name of the hospital was changed to that of the "Massachusetts State Sanatorium" in accordance with the decision of the Trustees to exclude all far-advanced and hopeless cases from the institution.

During the year 1901–02, at the suggestion of the State Board of Charity, five new buildings were added, — an administration building, a recreation hall, a large dining-room and two new wards, — thus increasing the capacity of the institution to two hundred and fifty beds. In consequence of the larger number of patients, a second medical assistant for the regular service was appointed at this time.

By statutes enacted in June, 1903, chapter 445, and under chapter 75 of Resolves of 1904, after a careful study of the question by the State Board of Charity, provision was made for the addition of "four brick cottages," two to be used as general wards, one as a possible "probation ward" and another as an "infirmary" for twenty or thirty patients who might require special nursing during severe illness. These wards were completed in 1905, with the exception of one spoken of as a "probation ward," which, owing to the unexpected expense of establishing a new heating plant, was omitted. The infirmary was finished later. The capacity was thus increased to about three hundred and eighty beds.

At this time, in 1905, the expense per capita was $8.83 per week, as against $9.36 in 1904.

In 1904 the Boston office was removed from 181 Tremont Street to the Out-Patient Department of the Massachusetts General Hospital, the duty of examining patients for admission falling upon the resident assistant physicians of the Sanatorium, instead of the attending physicians. Examining offices were also established in Worcester, Lowell, Springfield, Fall River and

Pittsfield, special examiners having been appointed to these positions.

In 1905 two women members of the Board of Trustees were appointed, making the number seven in all.

In the same year, at the suggestion of the State Board of Charity, an out-patient department was established at the Sanatorium, for the benefit of patients who were boarding in the surrounding farm-houses but not connected with the Sanatorium. Two local physicians in Rutland kindly consented to take charge gratuitously of this department; but thus far, according to the Superintendent, in his eleventh annual report (1907), their services have not been in such demand as was at first thought would be the case, there being on an average only eight or ten calls weekly. Most of the work of this department now consists of laryngeal examinations and treatments done by the assistant physicians in the Sanatorium.

In 1906 the Trustees decided to change the form of administration by abolishing the positions of attending physicians, and by placing the whole medical department under the charge of a Medical Superintendent and his assistants. Following this decision, Dr. E. O. Otis of Boston (who had been chosen to fill the place of Dr. Bowditch after the latter's withdrawal on January 1, 1906) and Dr. H. C. Clapp ceased to be attending physicians and were made consulting physicians, to serve without salary. Dr. Frederick L. Hills was also chosen as Medical Superintendent, in the place of Dr. Walter J. Marcley, who resigned to take charge of the Minnesota Sanatorium.

The cost per capita during this year again increased to $9.38, largely due, doubtless, to the general increased cost of living everywhere. In 1907 this cost was increased to $10.07, probably due to the same cause as before.

The report for 1904 contains an interesting statement as to the

effect of the Sanatorium upon adjacent real estate values and upon the health of the native population of Rutland. On the assessor's books the total valuation of the town in 1904 was $704,183; in 1895, before the Sanatorium acquired any land, it was $518,180, — a gain of $186,000. The number of deaths from tuberculosis (exclusive of those who came to the town to be treated for the disease) for the whole time since patients were first received, viz., 1899 to 1904, inclusive, — six years, — was eight; for the six years immediately preceding (1893 to 1898 inclusive), eleven; for six years 1887 to 1892 inclusive, eleven; for six years 1881 to 1886 inclusive, fourteen. The town has thus averaged for the last twenty-four years two deaths per year from tuberculosis in a population averaging about one thousand. During the six years previous to 1904, with increased population, the deaths from this cause were less than before.

A table of comparative results expressed in percentages during the first eight years of the Sanatorium is hereby appended. It is taken from the tenth annual report of November 30, 1906.

Comparison of Percentages in the First, Second, Third, Fourth, Fifth, Sixth, Seventh and Eighth Years.

	1898–1899.	1899–1900.	1900–1901.	1901–1902.	1902–1903.	1903–1904.	1904–1905.	1905–1906.
Per cent. of "arrested" or "apparently cured" cases.	34.28+	42.35	46.12	48.31	48.97	44.8	33.7	39.1
Per cent. of all classes of "improved" cases.	39.36+	44.70	47.64	44.51+	43.00+	47.7	58.9	52.1
Per cent. of "not improved" cases,	26.04+	12.95	5.74	6.73+	7.90+	7.4	7.4	8.8

Percentage of Incipient Cases "arrested" or "apparently cured."

	1898–1899.	1899–1900.	1900–1901.	1901–1902.	1902–1903.	1903–1904.	1904–1905.	1905–1906.
"Arrested" or "apparently cured,"	64.60	72.90	73.00	72.00	72.60	75.8	64.2	74.4

A quotation from a study of the subsequent histories of patients who had left the Sanatorium, taken from the ninth annual report of September 30, 1905, is also added.

Subsequent Histories to Date (October 1, 1905) of Former Patients of Both Departments treated in the Sanatorium Previous to October 1, 1904.

The subsequent histories of former patients make the crucial test of any method of treatment, and are of vital importance.

For the first time in the history of the Sanatorium, tabulations of the results of former treatment have been made with painstaking care, and are hereby appended. That they give us convincing proof of the value of the work at Rutland in the past six years we think no one can deny.

Total number treated,		2,200
Able to work,	1,179	
Not able to work,	34	
No reply to letter,	377	
No trace,	49	
Dead,	561	
	2,200	
Total number of "arrested" and "apparently cured,"		989
Able to work,	743	
Not able to work,	14	
No reply to letter,	139	
No trace,	19	
Dead,	74[1]	
	989	

In reading these figures, it must be remembered, moreover, that failure to receive replies or inability to trace the patient does not mean necessarily that the result has been unfavorable. In many of the earlier cases we have failed to receive news for months after the first inquiries have been made. Oftentimes, too, favorable accounts have been received of former patients through others. It is reasonable to suppose, therefore, that many of those from whom we have not heard as yet are still alive and at work.

The estimates for expenses during the ensuing year in the report of 1907 are as follows: —

[1] Four have died from causes other than tuberculosis.

THE MILLET SANATORIUM AT EAST BRIDGEWATER.

For maintenance,	$185,000 00
For new cow barn,	10,000 00
For other special matters,	23,375 00
The estimate for maintenance is made up as follows: —	
Food,	$81,470 72
Salaries and wages,	51,525 84
Heat, light and power,	15,653 07
Repairs and improvements,	6,682 43
Farm,	6,114 14
Furnishings,	4,260 60
Miscellaneous (includes water, medical and hospital supplies, and all other expenses),	19,293 20
	$185,000 00

THE MILLET SANATORIUM AT EAST BRIDGEWATER.

This sanatorium was founded and incorporated under the laws of Massachusetts in 1900, by Dr. Charles E. Millet of Brockton, Mass., and his two brothers, in memory of their father, Dr. Asa Millet of East Bridgewater, who for many years was a physician of that locality renowned for his unselfish devotion to others, his wonderfully good judgment, and willingness even in his advanced years to try new methods of treatment which appealed to his common sense.

His son, Dr. Charles E. Millet, conceived the idea of converting the old paternal estate into a sanatorium for tuberculous patients, in consequence of his success during the two years previous to opening the sanatorium in treating patients in their homes by making them sleep on open balconies. With the cordial consent of the brothers and the financial aid of the late Mrs. Abbie Wild Ford of Brockton, the estate was changed to a sanatorium, which was opened in 1900. The buildings are at an elevation of only one hundred and thirty feet above sea level, about twenty miles from the sea, and thirty miles to the south of Boston.

The original house was a fine old wooden structure, similar to many seen in that part of New England, built from one hundred

to one hundred and fifty years ago. In the basement is installed a complete hydrotherapeutic establishment, which is used extensively in the treatment. In recent years additions have been made in the shape of a large two-story ward attached to the rear of the building, and especially adapted to open-air treatment by means of wheeling the patients' beds on to adjacent piazzas.

About 1901 it became necessary to build small "shacks" to accommodate the increased number of patients. It is believed that this was the first effort to bring the "shack" into use in this country. These "shacks" are near the main building, made of wood, twelve by eighteen feet, with flat roofs, mounted on posts six feet from the ground, and so arranged as to allow free passage of air on all sides. The interiors are divided into a bedroom twelve feet square and a dressing room six by twelve feet. In the latter is a chimney and stove, a set wash-basin with running water and water-closet, a movable bureau and a wardrobe.

The capacity has been increased from ten beds in 1900 to forty-five in 1908. The Sanatorium is heated by steam and lighted by electricity. There are separate buildings for nurses and servants. A private dairy farm of tested cows is a valuable adjunct to the institution, and the sewerage system has been perfected at heavy cost. The water supply is excellent and abundant.

The method of treatment is such as is used in all similar institutions, with the inevitable differences of detail that must exist in different institutions. Special stress is laid upon hydro-therapy by Dr. Millet, who also advocates the use of as little medicine as possible. The Matron is a graduate nurse, and her assistants are members of the Training School in hydro-therapy, massage, practical and tuberculosis nursing, connected with the Sanatorium. Dr. Millet is the Physician-in-Charge, and makes daily visits to the Sanatorium. The institution is not a charitable one, although especially moderate charges are made to people of limited means.

THE MILLET SANATORIUM AT EAST BRIDGEWATER. Showing Shacks.

Patients with incipient or moderately advanced disease are received; but it is not intended for far-advanced and hopeless cases.

The charges vary from $15 to $35 a week, according to size and location of the room or "shack." "Shacks" are from $25 to $35 a week, and rooms from $15 to $35. In the two wards, one for men and one for women, with five beds each, the price is $10 a week. This reduction in price is allowed in worthy cases after fullest investigation. The institution is not endowed. The cost per patient is, on an average, $15 per week.

Results, as stated by Dr. Millet, are: "About 33⅓ per cent. of 'cures,' many advanced cases having been admitted."

OTHER PRIVATE INSTITUTIONS IN MASSACHUSETTS FOR THE TREATMENT OF CONSUMPTIVES.

The above-mentioned sanatoria are the largest in the State; but there are several small establishments, notably in the town of Rutland, under the charge of Dr. David P. Butler and Dr. George E. Derrick, who have had much experience in the treatment of tubercular disease. These establishments for the most part partake of the nature of boarding-houses. In some cases they are cared for by former patients of the Rutland Sanatorium, but are under the supervision of the above-mentioned physicians, who make weekly visits, the cost of which is included in the price of board. They help to fill a great need in our communities, for the care of the more advanced types of the disease. Numerous boarding-houses which receive cases refused by the State Sanatorium exist in the town of Rutland; but they have no official connection with any physician or with the Sanatorium.

An excellent small sanatorium for well-to-do patients was established at "Springside," Pittsfield, Mass., about two years ago, by Miss Mary E. Sullivan, who for eight years was head nurse in the men's ward at the State Sanatorium. A special staff of the best-

known physicians of Pittsfield is connected with this establishment, but their services when wanted are not included in the price of board.

Of the great need of sanatoria, in the strict sense of the term, there can be no doubt in the minds of those who look carefully into the subject. The experience of those in charge of the Sharon Sanatorium alone would prove this. The number of applications there far exceeds the capacity of the institution, and many cases who would be greatly benefited by treatment are turned away from lack of room.

At the same time, the limitations of sanatorium treatment must be kept in mind. Those who have had the greatest experience know that it is only one of many methods to be employed in the attempt to check the enormous mortality from tuberculosis. Hospitals for the far-advanced cases, dispensaries, day and night camps, instruction and care in the homes, in fact, every method known to science must be brought to bear, and only by cordial and vigorous co-operation among the component parts can we expect to accomplish the desired result.

CHAPTER VII.

TUBERCULOSIS IN THE STATE INSTITUTIONS FOR THE INSANE.

Charles W. Page, M.D.

It is well known that mortality from pulmonary tuberculosis has been high in most hospitals for the insane, and excessively so in some. But obvious causes contribute to such results. All the older institutions for the insane have for years been maintaining within their walls cases of open tuberculosis, which, in connection with inefficient methods of disinfection, have provided abundant seed for the propagation of this disease. Then the cases committed to insane hospitals are, as a rule, persons in whom the mental disorder indicates defective physical conditions, — physiological, nutritional or organic instability; and one defect of this order may readily lead to other debilities, establishing in the end a condition of the lung tissue which favors tuberculous infection. Too often such predisposed individuals are crowded into wards inadequately supplied with sunlight and improperly ventilated.

Most insane victims of pulmonary tuberculosis in hospitals for the insane represent the demented classes that are naturally inactive and which are required to exercise but little, especially in the open air. Many of them are careless and untidy in their habits, thus greatly increasing their chances for infection. Besides, it is difficult to detect the incipient and curable stages of tuberculosis in such patients. Reflex irritation, cough, etc., are often absent. They seldom complain of pain or illness of any sort, and when suspicion of pulmonary disease leads to a physical examination, they rarely co-operate with the examiner,

and thus baffle painstaking efforts to determine the existence or non-existence of early symptoms of phthisis.

However adequate may be the explanation of the high death-rate from tuberculosis in hospitals for the insane, a comparison of such mortality rates, as they have occurred in various hospitals, will suggest the reflection that some of the agencies which favor the virulence and spread of this disease are not everywhere equally active, and the logical conclusion that such agencies are generally susceptible to suppression or modification. Statistics on this matter vary so widely from year to year, even in a single hospital, that a safer judgment will follow when conditions covering a series of years are employed as a basis for such comparison. Consequently, a tabulated statement is appended, based upon five-year periods. To this table there are affixed the results for the last hospital year. The remarkable showing of the table is the reduced percentage of the mortality due to tuberculosis which has taken place in recent years.

The Taunton Insane Hospital, the second oldest Massachusetts state hospital, reported for one year eighty-three deaths, of which number twenty-eight, or 33 per cent., were due to tuberculosis. Last year the same hospital reported one hundred and twenty-eight deaths, of which number five, or only 4 per cent., were due to tuberculosis. The interval of time between the above quoted reports was just fifty years. It is possible that conditions were exceptional, and in opposite directions as regards those leading to tuberculous mortality, in each of the years contrasted; yet little if any satisfactory data can now be obtained, especially of the earlier experience, that will account for the different results that now appear so remarkable.[1] Fortunately, efforts to do so are less imperative since the later report is so much the more satisfactory. The improved results at Taunton,

[1] This hospital had been open but a few years, and was at first partly filled with chronic cases from the Worcester hospitals and almshouses.

as illustrated by the above comparison, reflect in a great measure, no doubt, the largely reduced mortality from tuberculosis which has come about in the State at large in the past fifty years. Then, in the same period, the science of hospital disinfection has greatly developed. Furthermore, at Taunton the old ward buildings have been in a considerable measure replaced by modern structures, insuring more sunlight, better ventilation, etc. Taunton, while providing no special wards for incipient cases, has, in common with all the state hospitals, segregated, more or less completely, cases of open tuberculosis.

Conclusions drawn from the Taunton reports, as instanced, may be comforting, but they do not apply to the broader facts with regard to tuberculosis as it still affects all the inmates of the several state institutions for the insane.

The Worcester Hospital for the Insane, established twenty years earlier than the Taunton hospital, never reported quite so high a tuberculosis mortality as did Taunton the first ten years of its operations. The year that Taunton reported 33 per cent. of the total mortality as due to tuberculosis, Worcester reported 11.2 per cent. But ten years later, in 1863, the death-rate at Worcester due to tuberculosis was 30 per cent. of the total death-rate, while that at Taunton was reduced to 23.1 per cent.

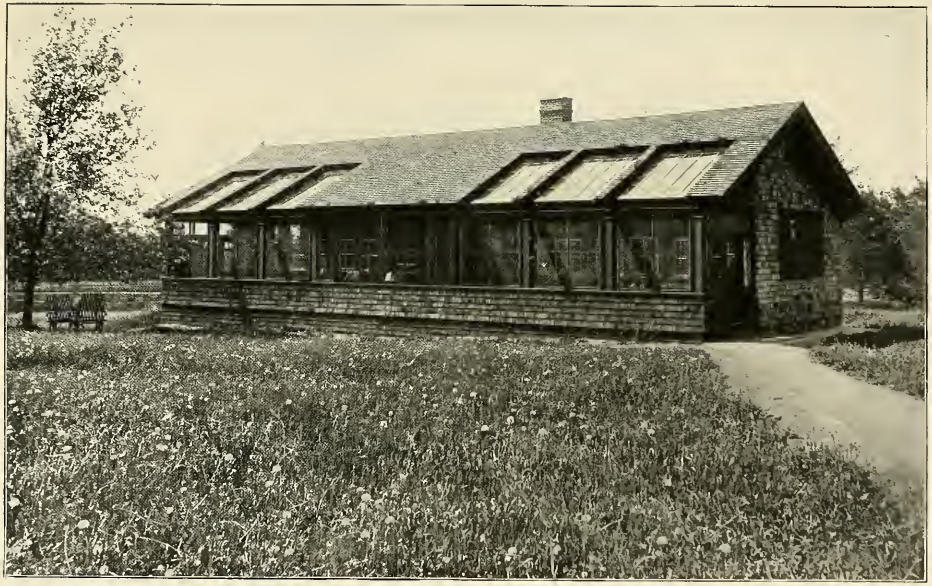
After the Worcester Insane Hospital had occupied its original buildings about fifty years, these were vacated in 1878 for a new structure removed from the crowded city. Prior to this removal, the tuberculosis percentage of mortality for a five-year period had fallen to 5.9 per cent. Contrary to ordinary expectation, this ratio increased to 12.5 per cent. for the first five-year tabulated period after the new buildings were occupied. While independent buildings for tuberculous patients have not been provided there, separate and special wards are utilized for the treatment of such cases.

The Northampton State Hospital had a high percentage of tuberculosis mortality from 1860 until after 1880, but since then great improvement in this respect has been observed. No special wards for the treatment of tuberculosis have been provided at Northampton, but efficient precautions against the progress of this scourge must have been taken.

The Danvers Insane Hospital has kept the death-rate from tuberculosis within the general average rate for the whole group of Massachusetts hospitals for the insane until the past year. For the last eight years special efforts to limit the ravages of tuberculosis have been made. For a number of years tents on the lawn were occupied through as much of the year as the weather permitted. Subsequently there were erected two permanent one-story wooden buildings, one for men and one for women, each sufficiently large to accommodate twenty patients. The men's ward has been occupied eighteen months; the women's ward about three months.

Pulmonary tuberculosis has caused about the same proportion of deaths at the Westborough Insane Hospital as it has at Danvers; the tabulated percentages of the two institutions vary but slightly. It is fair to infer, then, that about the same conditions prevail at both institutions, and that the same explanations will apply in both cases. At Westborough shacks for the open-air treatment of tuberculosis have been in use for several years, and recently a special sanatorium ward for about twenty such cases has been erected.

Besides the five state hospitals for the insane authorized to receive acute cases of insanity, Massachusetts has several special institutions designed to care only for such chronic cases as are transferred from the insane hospitals. Naturally many such chronic cases fall victims to tuberculosis in spite of intelligent management. Entering an asylum with lowered vitality incident



DANVERS INSANE HOSPITAL AT HATHORNE. — Special Ward Building for Tuberculous Patients.

to the mental disease, and augmented by prolonged hospital residence, where necessary asylum economies are not calculated to fortify the individual against infectious agencies, it naturally follows that a large percentage of such patients succumb to the tubercle bacillus, a germ which appears to be first in the list of those causing terminal infections, and adapted to overcome animal beings that have suffered reductions in the vital powers of resistance.

The Worcester Insane Asylum began operations in the old buildings vacated by the Hospital. Into such wards it had to receive the culled-out chronic cases from the state hospitals. It would seem as though these conditions favored a high death-rate from tuberculosis in this as well as the other asylums. Under the circumstances, a percentage of 27.8 is not surprising, especially since it is noted that the percentage indicates simply the ratio of tuberculosis to other fatal diseases, and the further important fact that the percentage of all deaths based upon the daily average population of the asylum was only about one-half as high last year in the Worcester Asylum as it was in the state insane hospitals.

For a number of years the Worcester Asylum has been developing a colony in North Grafton, where better facilities for special methods of treating tuberculosis can be provided. During the past season one man with pulmonary tuberculosis has been living in a tent pitched in the woods; this case has improved greatly, gaining much in weight.

At the Medfield Asylum there are about fifteen hundred patients. They occupy modern buildings, but in most respects they are to be classed with the inmates of Worcester and the other asylums. Those manifestly subject to tuberculosis are segregated in special buildings, and approved methods of treatment are employed. The percentage of 19.5 is no doubt low for such cases as are segregated at Medfield.

At Tewksbury, where there is a department for the chronic insane, a percentage of 18.6, representing the tuberculosis mortality, could not be obtained were not special wards for such cases provided and special treatment given. Two hospital buildings specially constructed for the care of such cases have been erected; one hundred men and forty women can be accommodated in these buildings. Besides, there are four shacks, each of which will accommodate twenty patients. Of course the insane constitute but a small proportion of the tuberculous cases thus managed at Tewksbury.

At the State Farm there are five hundred and forty of the criminal insane. Last year there were only twenty-three deaths from all causes; thirteen of these died of tuberculosis, thus giving a percentage of 56.5, which cannot be considered excessive under the circumstances that must prevail in such institutions.

The Gardner Colony has a limited number of patients, mostly men, and only a few deaths occurred there last year; but as more than one in four of those who died had tuberculosis, the percentage is 26.6.

The insane department at Foxborough has been receiving patients but a short time, and previous to the present hospital year had had no deaths due to tuberculosis.

For the past year 14.6 represents the percentage of deaths from pulmonary tuberculosis, when all the inmates of Massachusetts state institutions, hospitals and asylums are considered together. Taking the combined population in the five state hospitals, the percentage is 10.6.

In the year 1900 Dr. A. H. Harrington collected statistics on the subject from hospitals for the insane throughout the United States. In his published report[1] he does not single out the Massachusetts hospitals, but does group those in New England,

[1] Proceedings American Medico-Psychological Association, 1900, 7, 202.

DANVERS INSANE HOSPITAL AT HATHORNE.—Special Ward Building for Tuberculous Patients, showing Interior of Ward.

and shows that 11.9 per cent. was the average of tubercular mortality in the whole group. Compared with that statement, the statement is warranted that Massachusetts insane hospitals now have a better average than that for all New England. Dr. Harrington also found that the percentage of the total death-rate due to tuberculosis in the New England hospitals, when compared with the records of other groups of hospitals representing conditions in different sections of the country, was the lowest of all. In fact, the death-rate increased in the directions of south and southwest as follows: New England States, 11.9 per cent.; Middle States, 13.8 per cent.; Western and Southwestern States, 16.8 per cent.; Southern States, 20.1 per cent.

In order to understand to what extent Massachusetts hospitals are responsible for maintaining conditions which favor the spread of tuberculosis, the hospital residence of those who died from the disease the past hospital year is herewith tabulated: —

Table showing the Time of Hospital Residence of those who died of Pulmonary Tuberculosis in the Hospital Year, 1906–07.

FOR THE HOSPITAL YEAR, **1906–07.**	Worcester Insane Hospital.			Taunton Insane Hospital.			Northampton State Hospital.			Danvers Insane Hospital.			Westborough Insane Hospital.			Total.		
	M.	W.	T.	M.	W.	T.	M.	W.	T.	M.	W.	T.	M.	W.	T.	M.	W.	T.
Under one month,	–	–	–	–	–	–	–	–	–	1	–	1	–	–	–	1	–	1
From 1 to 3 months,	–	–	–	–	–	–	–	–	–	3	2	5	–	–	–	3	2	5
From 3 to 6 months,	–	1	1	–	–	–	–	–	–	–	1	1	–	–	–	–	2	2
From 6 to 12 months,	–	–	–	–	–	–	–	1	1	1	1	2	–	1	1	1	3	4
From 1 to 2 years,	–	–	–	–	–	–	1	–	1	–	1	1	2	4	6	3	5	8
From 2 to 5 years,	–	–	–	2	1	3	1	2	3	4	5	9	3	4	7	10	12	22
From 5 to 10 years,	4	2	6	–	1	1	1	–	1	2	5	7	1	1	2	8	9	17
Over 10 years,	5	5	10	–	1	1	–	–	–	1	1	2	–	1	1	6	8	14
Total,	9	8	17	2	3	5	3	3	6	12	16	28	6	11	17	32	41	73

Table showing the Percentage of all Deaths due to Tuberculosis in the Massachusetts Institutions for the Insane.

	Worcester Insane Hospital.	Taunton Insane Hospital.	Northampton State Hospital.	Danvers Insane Hospital.	Westborough Insane Hospital.	Worcester Insane Asylum.	Medfield Insane Asylum.	State Hospital, Insane Department.	State Farm, Insane Department.	Gardner Colony.	Foxborough, Insane Department.
Based upon deaths in 5-year periods: —											
1840–45, ...	9.2	–	–	–	–	–	–	–	–	–	–
1850–55, ...	13.8	–	–	–	–	–	–	–	–	–	–
1860–65, ...	24.8	25.5	33.9	–	–	–	–	–	–	–	–
1870–75, ...	5.8	5.6	28.2	–	–	–	–	–	–	–	–
1880–85, ...	12.5	8.6	22.0	10.3	–	–	–	–	–	–	–
1890–95, ...	10.7	10.7	12.0	11.1	10.0	–	–	–	–	–	–
1900–05, ...	12.3	10.1	7.7	9.3	9.7	21.4	13.1	14.9	23.5	–	–
For the hospital year 1906–07,	8.6	4.0	7.0	15.3	15.0	27.8	19.5	18.6	56.5	26.6	–

Of the seventy-three deaths reported from the five insane hospitals, fourteen died within one year from the date of their commitment. In our northern climate, few cases of tuberculosis terminate in death within a period of twelve months from inception, hence it is fair to infer that these persons contracted the disease prior to their hospital residence. But three-fourths of the whole number had spent two years or longer within the hospital walls. A majority of these no doubt died from hospital tuberculosis. It seems unnecessary to tabulate the hospital residence of eighty-five others who died in the various state asylums. Each patient had experienced a more or less prolonged hospital residence before being transferred to asylum care. Such individuals can reasonably expect a change of environment only by death, and it seems to be a law of nature that terminal infections shall ultimately arrest a majority of human lives. In a series of one hundred autopsies performed in the Danvers Hospital Laboratory, it was found that terminal infections had invaded the heart's blood

in sixty-four cases, and the cerebro-spinal fluid in seventy-five cases.

The high tuberculosis mortality reported from Danvers Insane Hospital during the past year calls for further analysis. While the special wards for tuberculous cases were under construction, methods calculated to prevent or arrest this disease were less actively enforced than at present, and the use of tents was abandoned. Then the state care act, through the pressure of local economy in town and city management, operates to increase the commitment of some patients already infected with tuberculosis. As the public conception of the old forbidding lunatic asylums has been gradually brought into harmony with the new christening, — state hospitals, — candidates for the wards, as well as their friends, more readily assent to the suggestion that they resort to institutions of this class when health is broken. Patients have been received at Danvers when the sole evidence of insanity was the delirium incident to the terminal stages of tuberculosis.

Of those who died at Danvers last year, seven had been in the hospital less than twelve months, and six of these died within six months of their entrance. Again, the misleading possibilities of statistics when employed in connection with limited time or restricted circumstances should be borne in mind. This suggestion may be emphasized by noting that while for the hospital year ending November 30, 1907, Danvers had twenty-six deaths from tuberculosis, — a mortality per cent. of 15.3, — for the first half of the succeeding or present year, *i. e.*, the six months ending May 30, 1908, but three cases of tuberculosis have died in the hospital, — a mortality per cent. of only 2.5. The shack, or special ward for male patients with tuberculosis, has been in use eighteen months at Danvers, but this fact does not explain the reduced mortality from tuberculosis, although favorable results are being accomplished through the aid of this ward. Already it has re-

DANVERS INSANE HOSPITAL AT HATHORNE. — Special Ward Building for Tuberculous Patients, showing Veranda.

ceived thirty-four men by transfer from the wards of the main hospital. Of this number, nine have died, seven of the nine having shown physical signs of tuberculosis when admitted to the hospital. Of the thirty-four so far treated, sixteen are still inmates; thirteen of the number have gained in weight, — an average of twenty-one and one-half pounds; the other three have lost, — an average of six and one-third pounds. As a rule, open cases of tuberculosis are still cared for in certain parts of the main hospital, and a few have been too unreliable for residence in the special wards.

In order to give tuberculous inmates the benefit of special treatment in the incipient stages of the disease, a routine temperature examination, four times daily, of all chronic demented patients, and others as circumstances suggest, is repeated several times each year. A continuous rise in temperature or a marked loss in bodily weight suffices for an order of transfer to the tuberculosis ward, unless the patient is too irritable or excitable for continuous residence there.

The continued use of the tuberculin test in a large series of cases covering a period of several years gave such unsatisfactory results in differentiating incipient cases that it has been discarded at the Danvers Insane Hospital. Although tuberculin has failed to identify early tubercular lung disease, faith in its reliability, when properly used, to demonstrate the presence without regard to location of infected foci, is not diminished. The ophthalmic reaction has also been found to be unreliable in detecting incipient tuberculosis, and has been discarded.

In addition to the many phases of the tubercular problems which arise in connection with the insane, the state hospitals have to contend with bovine tuberculosis, as each hospital has a farm with a herd of milch cows. For the past twenty years this disease has been so common in the hospital dairy stock as to occasion serious

concern. For a time it was feared that the milk from the diseased cows might be communicating tuberculosis to the patients. Later, when new theories modified such views, there still remained the great annual financial loss to the State from the steady inroads of this disease. The experience at Danvers probably duplicates that at all the other state hospitals. In 1888, when the first official examination of horned cattle belonging to the hospital was made, out of the sixty-one animals, twelve were condemned as worthless, twenty-five were classed as probably diseased, and twenty-four only were given a clean bill of health. Since that time animals manifesting this disease have been discarded and fresh stock brought in. Measures to insure the disinfection of the stable and to improve the sanitary conditions of the barn have been enforced, and yet no abatement of the infection has been evident. From time to time the tuberculin test has been employed. In the year 1900, 64 per cent. of the whole herd reacted. The Bon system of removing diseased animals from the barns has been steadily practised and thorough disinfection carried out, but without appreciable effect in diminishing the prevalence of the disease. In April, 1906, the Danvers Hospital Trustees decided to adopt von Behring's method of immunizing dairy stock to prevent infection from tubercle bacilli. This practice consists in giving two injections, three months apart, of a special quality of human tubercle bacilli into the blood current through the jugular vein. The Northampton State Hospital began to treat young animals in this manner at about the same date, and thirty calves had been thus immunized at the close of the last hospital year.

To date, Danvers has seventy-eight on the list of immunized animals. Time alone can satisfactorily demonstrate the value of this system of fighting bovine tuberculosis, but in Europe von Behring's Bovovaccine has been in extensive use twice as long as in the United States, and all reports seem to support the original

claims that by this treatment horned animals are rendered comparatively immune. No injurious results from the operation have been observed at Danvers.

The tuberculin tests so far made on immunized stock have been generally negative, but it is recognized that the vaccination sensitizes the animals for a period of at least seven to twelve months. (Von Behring and Römer.)

How much credit for such results as have been obtained at the Danvers Insane Hospital should be attributed to the immunizing process may remain a question, for a time at least; but such favorable evidence, constantly accumulating, stimulates courage to believe that a certain means for checking bovine tuberculosis has been discovered. And if bovovaccination proves successful, it is not too much to expect that there will be at our command, in due time, equally efficient methods for checking human tuberculosis.

CHAPTER VIII.

TUBERCULOSIS IN THE PRISONS OF MASSACHUSETTS.

Joseph I. McLaughlin, M.D.

The Massachusetts Board of Prison Commissioners have the control and management of the three large prisons of the State, the Women's Reformatory at Sherborn, the Reformatory at Concord for young male adults and the State Prison at Charlestown. In addition, they have a general supervision over the twenty-one jails or houses of correction or both in the various counties. As the latter, with two or three exceptions, have no appointed hospitals and issue no tabulated report of the sick inmates, it is possible to consider in this study only the measures in use for the care, and more particularly the prevention, of tuberculosis in the larger institutions named above. The two reformatories, being of more recent construction and situated in the open country, with a wide area of land adjoining which is owned by the State, present far less difficulty in carrying out appropriate measures for the control of tuberculosis than does the State Prison, the oldest of the three. It is intended, then, to speak but briefly of the former institutions and more at length of conditions at the State Prison.

At the Women's Reformatory in Sherborn tuberculosis has not gained a very strong foothold, and this can be attributed to a great extent to the measures employed at this excellent institution to maintain the general health of the prison, such as gymnastic exercises, a liberal amount of work in the open air, light gardening and farming, etc. From the product of the fields the table of the inmates is constantly supplied with a generous quantity of fresh fruit and vegetables. The good results following such manage-

ment are shown in the yearly medical reports. During the last twelve years only two deaths occurred from tuberculosis, with an average population of nearly two hundred and fifty.

The Reformatory at Concord, established in 1884, for the imprisonment of young male adults with sentences ranging from twelve months to five years, has a very low general death-rate, with tuberculosis as the principal cause of death, as seen from the following: from 1855 to 1907 inclusive, the average yearly population was eight hundred and thirty-seven. The average yearly number of deaths from all causes was three, of which one was due to tuberculosis.

Tuberculosis is a community disease, and develops and spreads most readily in places where the accepted rules of sanitation are not enforced. Cleanliness, proper ventilation, good food and exercise are of the greatest importance in protecting the individual from infection. In a state prison, however, it is most difficult to observe these requirements, inasmuch as the community is largely composed of physical and moral degenerates, and society demands that it shall be surrounded by such safeguards as shall make escape impossible.

It is not to be wondered at that in the Massachusetts State Prison the physician in former years waged a losing fight against tuberculosis, when we read of the conditions existing at that time. The prisoner spent the greater part of his time in a cell three and one-half feet wide, seven feet long and seven feet high, having a solid iron door with a small grating at the top, which served, or was supposed to serve, the purpose of admitting a sufficient quantity of light and air. In the lower part of the encircling prison wall there were no windows, and even in the hospital with its fourteen cells there were but three small windows. This criticism does not apply, however, to cells built in later years. For instance, some are nine and one-half feet long by six feet wide,

with the windows in the outer wall extending almost from floor to roof, while others are sixteen feet long, twelve feet high and eight feet wide, all the cells in addition being supplied with a suitable means of ventilation. The larger cells have two windows at the top opening directly into the outer air.

At the present time the physician sees each prisoner when committed, and if there is a suspicion of his having a communicable disease he is kept under special observation until all doubt is removed. All others are assigned work, commensurate with their abilities, by the warden. The clothes worn during imprisonment, except in certain cases, are destroyed, and a new outfit is given them at the time of their discharge. Each prisoner's clothing and bed clothes are marked with his name, which reserves them for his wear only, and these also as a rule are destroyed when the prisoner is discharged. In the case of a prisoner who is suspected of having a communicable disease, all danger to others is avoided by the separate washing and sterilization of his clothing.

The regular prison fare is nourishing, generous and varied, and consists of milk with cereals or meats and bread and coffee for breakfast; stews, fish or meats with vegetables and bread for dinner; and bread, coffee, prunes or apple sauce, etc., for supper. Each prisoner is also given the privilege of ordering enough fruit in season once a week to furnish a daily supply for the remainder of the week. As an extra precautionary measure, all food or clothing coming from friends or relatives is withheld from the prisoner.

The workshops are well lighted and ventilated, and the character of the work is healthful. The dark punishment cell ("solitary confinement," so called), with its deprivation of light and the diet limited to bread and water, as time goes on is less frequently called into use in dealing with refractory prisoners. The number of punishments of this nature in one year at the State Prison has for

HOSPITAL PRISON FOR CONSUMPTIVES AT RUTLAND.

a considerable period exceeded by only a small margin the number of punishments of this type given in one week in penal institutions in other States. Bodily cleanliness is rigidly enforced, each prisoner being compelled to bathe the whole surface of the body at least once a week.

The present administration having practically extended over a period of fifteen years with a view to comparative results, the records of the two preceding corresponding periods were looked up, and this brief summary is presented: —

PERIODS.	Average Yearly Number of Prisoners.	No. of Deaths from All Causes per 100 Prisoners.	Percentage of All Deaths Due to Tuberculosis.
1861–75 inclusive, ...	524	1.74	54
1876–90 inclusive, ...	638	1.68	49
1891–05 inclusive, ...	771	0.57	32

The average age at death from tuberculosis during the last period was twenty-eight, exclusive of two whose ages were forty, one at forty-eight and another at fifty-one. The average duration of imprisonment at time of death was three years, exclusive of two terms of six years each, and two others, one of whom was in prison sixteen years, the other twenty-four years.

PRISON HOSPITAL AT RUTLAND.

Although the statistics of tuberculosis in our reformatories and prison compared most favorably with those of similar institutions in this and other countries, the Board of Prison Commissioners, through its chairman, Mr. Frederick C. Pettigrove, keeping in touch with the best thought of the day, looked for better results, and effected the passage of a law in 1905 establishing a hospital for the reception of prisoners ill with tuberculosis from the various prisons and jails of the State. A site was selected about five miles

from the State Sanatorium at Rutland, on land with an elevation of about one thousand feet above the sea level, and the hospital built thereon received its first patient in the latter part of September, 1907. When a prisoner receives his court sentence and is committed to a jail or prison, as the case may be, and is then found to have tuberculosis, the attending physician fills out a certificate and forwards it to the Prison Commissioners, who then order the prisoner transferred to the Prison Hospital at Rutland.

This hospital is built on the pavilion plan and consists of two large wings, placed parallel, which run directly north and south; an administration building joins the northern ends of the two ward pavilions, the three buildings forming three sides of a large rectangular area. This area on its fourth side will be enclosed by a stockade wall so placed on the slope of the hill as to offer no obstruction to the view or the warm, pure southern breezes. Keeping in view the necessity of an abundance of pure air and light, the buildings are so arranged that the patient gets the full benefit of both when conditions permit. The walls of the east dormitory are made of corrugated iron on a wooden frame, the walls of the west dormitory of cast stone, the administration building of rubble stone. The dormitories or wards are large, with double tiers of windows, suitably grated, extending to the roof, and at the northerly end of each, adjoining the administration building, are rooms for the more advanced or special cases. Long, open iron-grated verandas at the sides and ends of the dormitories afford the opportunity for open-air treatment day and night.

ROOF
BOILER ROOM UNDER
LAUNDRY
KITCHEN
REFRIG
DOCTORS OFFICE
DISPEN SARY
LABORA TORY
DINING ROOM
STORE ROOM
LINEN
WARD
RECEP TION ROOM
TOILET
TOILET
DOMESTIC BUILDING
PIAZZA
WARD
DRESS ING ROOM
SCALE-FEET
0 10 20 30 40
PLAN OF
HOSPITAL PRISON
FOR
CONSUMPTIVES.
WEST RUTLAND, MASS.
WEST DORMITORY
EAST DORMITORY
SLEEP ING PIAZZA
COVERED SUN PIAZZA
OPEN SUN PIAZZA

CHAPTER IX.

THE TREATMENT OF SURGICAL TUBERCULOSIS IN MASSACHUSETTS.

Edward H. Bradford, M.D.

In the publications of the various associations engaged in combating tuberculosis, as a rule more attention is paid to the attempts to check the pulmonary form than to the surgical efforts against it. This is to be explained by the fact that public attention has been turned more especially to the medical rather than the surgical features of tuberculosis, and also because the surgical type is not as threatening a source of contagion as that more common form, — phthisis. Bone tuberculosis is in its most aggressive form to be seen in childhood, and is usually cared for in the family home. In adult life the active phase of the disease has terminated, if not fatally, in some form of crippling deformity which may impair individual activity but does not endanger public health. In the severer cases cripples are objects of pity and charity but not of medical care, and are to be found either in the almshouse or in private homes, where they do not endanger the health of the community.

The distressing nature of bone tuberculosis, and the severe infliction it often entails, however, justifies every effort, surgical as well as medical, to eradicate or check it. The closest study of every feature and manifestation of one of the chief maladies crippling mankind is a public duty.

Surgical tuberculosis is a broad subject, and in this chapter attention is paid chiefly to that form affecting the bones, not only because it presents one of the most common forms of surgical tuberculosis, but because the osseous system plays so important

a part in human activity that special arrangements are often needed to meet the indications of treatment demanded.

The therapeutics of an infection depend in a great measure upon the accepted theory of the nature of the disease. What is now classed as bone tuberculosis has passed through various phases of medical classification. In the past medical generation it was still classed as scrofula, and a survival of the old "humoral pathology" persisted. When this was overthrown by the acceptance of the theory of "cellular pathology," bone tuberculosis was attacked chiefly as an affection of a definite tissue which demanded eradication. With the advance of the germ theory and the demonstration of the tuberculous nature of this form of caries, treatment was directed to the destruction of the germ; and more recently, since the theory of antitoxins and immunity has been developed, the chief aim has been to develop a condition of the tissues which would resist the invasion of the specific germs.

Corresponding to these different theories, the treatment of bone tuberculosis has ranged from the employment of issues, setons, the cautery, radical surgical intervention (*i.e.*, excision and amputation), the use of apparatus, the administration of drugs and antitoxins, to the employment of fresh air and activity for the development of normal and healthy metabolism.

In New England, and especially in Massachusetts, the facilities for the surgical treatment of bone tuberculosis were, until within the last fifty years, confined chiefly to counter-irritants, blisters, and to the relief of pain and discomfort. Hospitals were not equipped for chronic cases; where patients demanded admission, it was for amputation or the radical removal of diseased bone. The application of braces was left largely to instrument makers and empirics. Those suffering from these affections were aided chiefly by such advice and oversight as counseled good nutrition and the administration of tonics. In this respect New England

was in no way behind other communities. There was a general skepticism both in the minds of the community and in that of the profession as to the advisability of any attempts at treatment for what were termed the "scrofulous diseases." At present leprosy in Japan is popularly considered a divinely decreed blight, and not within human power to control; and, according to popular opinion of the past generation in this community, all attempts to cure children with hip disease and tuberculosis of the spine were regarded as futile and little more than palliative. It was even regarded by many as wrong to attempt to prolong the life of scrofulous children. Later, as the medical tradition of scrofula and the belief in the "humoral pathology" passed, direct surgical interference seemed to offer a hope of cure by the eradication of the diseased cellular tissue. Excision of the ends of the bone was commonly attempted at the hospitals where such cases were received. As rest was essential in the painful stages of tuberculosis of the larger joints, some form of fixation of the joint was regarded as advisable; and patients suffering from Pott's disease and disease of the knee and ankle were, when under medical care, kept in bed. Avoidance of fresh air and the administration of alcohol were commonly advised. A few even at this period recognized the advantages of country air, but organized efforts for climatic cure were not attempted.

Later, much attention was paid to furnishing patients with mechanical appliances which would correct deformity or protect the limb from jar. The treatment by counter-irritation, by long periods of enforced rest, followed, combined with radical surgical intervention where other measures failed. These constituted for many years the recognized methods of treatment for bone tuberculosis. The pathology of these affections was not well understood. Authorities discussed whether scrofulous bone affections were in reality tuberculous. As all doubts on this subject were

ended by the advance of pathological knowledge, the importance of some form of treatment which would directly check and overcome the tuberculous germs became apparent, and the efforts to develop a healthy condition of the body, and in that way overcome the tuberculous condition, seemed justified.

HOUSE OF THE GOOD SAMARITAN.

The beginning of a systematic attempt to treat those afflicted with bone tuberculosis, in Massachusetts, was made through the efforts of a noble woman, Miss Anne Robbins of Boston, who devoted not only her small fortune, but her life, to the establishment of the House of the Good Samaritan. This institution was founded in 1861 to receive patients who could not be admitted to the Massachusetts General Hospital, then the only large hospital in Boston. An especial ward was provided for children with hip and spine disease. Dr. Buckminster Brown, who in his early youth suffered from caries of the spine, and, recovering after years of suffering with a severe deformity, became a successful practitioner in orthopedic surgery, was placed in charge of this ward. Painstaking care was given to those admitted to the hospital, with the aid of such appliances as were then in use. The treatment was thorough, and those leaving the hospital were followed with charitable interest for years by Miss Robbins and her nurses. The advantages of country air were manifest, and those patients who were able to be moved and who did not require constant surgical attendance were placed in country homes in many instances, and later a farmhouse in the suburbs of Boston was utilized as a convalescent home for the institution.

A tribute of respect and admiration is due to the memory of Miss Robbins, who, alone and without the guidance of precedent and unsupported by the experience of others, more than fifty years ago founded a work which brought not only relief from suffering

GOOD SAMARITAN HOSPITAL AND DAY CAMP AT BOSTON.

and favored the ultimate cure of hundreds, but also developed an institution which, for skill and economy of administration, breadth of charitable effort and value of the work accomplished, might serve as a model even now to a generation which is enjoying the benefit of all that experience has taught in the last half-century. The work so wisely begun by Miss Robbins did not cease with her death, but by the co-operation of her friends has continued. The institution grew into the admirable Samaritan Hospital, at present maintained in Boston for the treatment of all chronic affections.

BOSTON CHILDREN'S HOSPITAL.

When the Boston Children's Hospital was established in 1869 it became evident that the treatment of bone tuberculosis would be demanded in the institution, and the results have justified this original opinion. The treatment of surgical tuberculosis, and especially of the larger joints and of the spine, has been an important feature of the work of the institution. As a continued and systematic treatment of these affections has been made at the Boston Children's Hospital for a number of years under the same direction, the improved results enable the observer to estimate the great advance that can be recorded in the treatment of bone tuberculosis.

The progress in the treatment of bone tuberculosis can be well illustrated by a comparison of the results now obtained with those recorded twenty or thirty years ago. For example, the mortality of hip disease at the hospital in Tübingen was 40 per cent.; at Kiel, 48 per cent. non-operative cases, 53 per cent. operative cases; at Marburg, 35 per cent. non-operative cases, 40 per cent. operative cases; at Heidelberg, 46 per cent. non-operative cases, 58 per cent. operative cases; in Zurich, 37 per cent. non-operative cases, 54 per cent. operative cases; in

Vienna, 17 per cent. in all cases; in Göttingen, a mortality of 40 per cent.; at the Alexandra Hospital in London the mortality was 26 per cent. These statistics represent the mortality of hip disease from twenty to forty years ago, *i.e.*, before the introduction of the modern methods of treatment in seashore sanatoria and convalescent homes. From such meager statistics as exist, the American mortality from hip disease twenty years ago was estimated as from 12 per cent. to 25 per cent. This included death from various causes connected with the original tuberculous coxitis; namely, tuberculous meningitis, septicæmia, septic nephritis, etc. In contrast to this, the latest statistics in the Boston Children's Hospital, giving the ultimate results of cases treated ten years ago, show a mortality of only 4 per cent. from all causes. This diminution of the death-rate may be fairly attributed in large part to improved methods in surgical treatment, as well as to better opportunities for out-door life, fresh air and activity. Statistics of mortality, however, do not indicate the only benefit which has followed surgical treatment in these forms of bone tuberculosis; even more marked are the limitations of the ravages of the disease, and the securing of ultimate results which ensure freedom from deformity and great disability. Those who have observed the gradual advance in the success in treatment can testify further to the less formidable character of the affection as it is now brought for treatment. This is in part due to the general improvement in public health, but largely to the earlier recognition of the disease and the better facilities for early and thorough treatment. This fact, so noticeable in this community, is confirmatory of what has been observed in other places where careful attention is paid to the care of this class of cases.

A similar statement can be made in regard to Pott's disease, which, next to pulmonary tuberculosis, is the most formidable of all the tuberculous affections. It may be said that at present,

under proper medical care, there should be no hump-backs, and that the mortality, which in the hands of the surgeons of the past generation was formidable, is now reduced to what may result from an attack of another disease or the entrance of a complication.

The advances in the methods of treatment consist not only in improvement in surgical intervention and in improved methods in the correction and prevention of deformity, but also in better methods in the treatment of the local condition and in the care and nurture of the patient.

When it was generally believed that diseased bone could not heal and was a foreign body causing irritation, the surgeon's recourse to the knife was necessarily extensive. Now that reparative power in diseased bone tissue under certain circumstances has been recognized, not only is there a greater reliance upon conservative measures, but operative procedures are less commonly and more carefully performed. The use of the Röentgen rays has given both greater precision to operative interference and a sounder judgment in having recourse to it.

Experience with appliances and in the use of plaster bandages, a more thorough knowledge of the nature of bone tuberculosis, when rest should be enforced, when activity is safe, have given the surgeon greater elasticity in his methods, and enabled him to employ with greater freedom the general methods of proved advantage in combating the tuberculosis and therefore in promoting a cure. The advance in the therapeusis of bone tuberculosis will be best understood if, not forgetting earlier pathological teachings, the present theory of treatment is explained.

While it is universally admitted that the best treatment for tuberculous affections is fresh air and such an environment as promotes healthy nutrition, — in other words, those conditions which aid in the development of sound tissue, — yet, in bone tuberculosis other factors of almost equal importance cannot be

overlooked. While tuberculosis of bone, if undisturbed, heals as does tuberculosis elsewhere, it is evident that, owing to the rigid nature of the bone and the inability of the cicatricial tissue to shrink the previously diseased structure into a small cicatrix of fibrous tissue, an extensively diseased bone, if the detritus of disorganized tissue is thrown off, leaves a gap which must be filled by resistant bone before a healthy bone substance capable of withstanding tuberculous invasion is established. This latter process needs an adequate amount of time; and time, therefore, becomes an important element in the care and cure of bone tuberculosis. Again, where a tuberculous tissue is exposed to constant bruising, the impaired cell development which follows, as well as the contused tissue, furnishes an excellent nidus for the development of tuberculous germs. This is well shown by the fact that tuberculosis of the upper extremities is less destructive and more easily arrested than the same infection of the larger joints of the lower extremities or in the spinal column. It is important, therefore, that all injury to the diseased tissue be avoided. It is for this reason that Pott's disease and hip disease were for many years considered incurable. The surgeon was unable, on account of the faulty means at his disposal, to prevent the patient from being subject to repeated injury of the diseased structure, except by retention in bed or close confinement. Protection from injury which involved the retention of the patient in bed for years, or for a long period, was not favorable to the proper metabolism, and was in itself an evil. With improved methods of fixation, the surgeon, however, is enabled with safety to take advantage of both therapeutic agencies, — protection from jar and freedom from confinement.

CONVALESCENT HOME OF THE CHILDREN'S HOSPITAL AT WELLESLEY HILLS.—Showing Shack Unit.

WELLESLEY CONVALESCENT HOME OF THE BOSTON CHILDREN'S HOSPITAL.

Cases of bone tuberculosis are especially benefited by the fresh-air treatment, as has been shown in many instances. The experience of the Wellesley Convalescent Home will serve as an admirable illustration. For several years the Convalescent Home consisted of a comfortable, well-arranged building, with the healthful surroundings found in a well-aired and well-drained farm. All the children showing constitutional enfeeblement were sent from the Children's Hospital to the Convalescent Home when active surgical treatment was not needed. The fresh air furnished was simply that which was to be obtained from the out-of-door play, and in rooms well aired by window ventilation. After some years the management of the Convalescent Home determined to give children suffering from surgical tuberculosis the advantage of fresh-air treatment in shacks. Circumstances delayed the first attempt until the winter months, and the patients were therefore placed in the shacks during the cold weather. The results have been so gratifying that the open-air method of treatment has become the established one for suitable cases of surgical tuberculosis for both summer and winter.

Tabulation of the increase in the percentage of hæmoglobin and weight in thirteen cases of tuberculosis of the knee, hip and spine thus treated shows very striking results. It was found that cases suffering from open abscesses did not show the improvement that was seen in cases where no surgical irritation existed.[1]

It is evident that in the surgical treatment of bone tuberculosis the indications for surgical interference must vary with the locality attacked. The treatment of tuberculosis of the vertebral bodies will necessarily be different from that of tuberculosis of the

[1] Dr. John L. Adams, "A Report of Seventeen Cases in Open-air Treatment for Surgical Tuberculosis in Children." Bost. M. & S. J., 1906, CLIV, 71.

sternum. Tuberculosis first attacks the spongy portion of the bone and by preference that portion of the spongy portion where the development of new cells is likely to take place, namely, the epiphyses or the juxta-epiphyseal line. Hard, dense bone is resistant to the tuberculous invasion. The spreading of tuberculosis in bone is probably not rapid, and is usually accompanied by the development of cicatricial bone tissue surrounding the focus or the portion invaded. The constructive cicatricial osteitis in the majority of cases establishes a cure by the encysting of the tuberculous mass, and by the gradual substitution of dense cicatricial bone for the diseased spongy bone tissue. The surgical treatment should therefore be directed toward aiding this natural tendency to cicatrization, rather than interrupting it. In extensive bone tuberculosis the periarticular tissues of the capsules of the synovial membrane usually become involved and at times all motion of the joint is painful. When, however, cicatrization and cure have been nearly established, some motion at the joint is not only harmless but may be beneficial.

The danger of mixed infection is not to be overlooked in bone tuberculosis. It has been shown that in the majority of fatal cases of joint tuberculosis death does not result from tuberculous generalization, but from a septicæmia due to secondary infection of the tissues previously affected by tuberculosis. The application of this fact to operative treatment is evident.

The special surgical procedures and appliances to be used in the tuberculous affections of different joints do not come within the scope of, and are not described in, this article, but the absence of any description here need not be construed as indicating a lack of the sense of importance of surgical measures. In bone tuberculosis constitutional treatment alone is but partially curative. Where surgical measures are thoroughly carried out, the best results can be anticipated.

STATE HOSPITAL SCHOOL FOR CRIPPLED CHILDREN, AT CANTON.—Showing Unit.

The subject of the general treatment of tuberculosis will also not be considered here, for the reason that bone tuberculosis as considered in this chapter is to be regarded as amenable to the same general treatment that is found of advantage in tuberculosis elsewhere in the body.

The present surgical treatment of bone tuberculosis may be regarded as having developed over that of the past to the extent of retaining the essence of that which was useful in past surgery, with the addition of what modern science has taught us. The fixation and protection of the joints are important at certain stages, namely, the stage of acute invasion and of progressive disease; but they are not indicated in all stages, and greater freedom should be allowed in the convalescent stages, where the exercise and hyperæmia of slight motion is found to be of advantage in restoring function to the cicatrized periarticular tissues. Counter-irritants, which were formerly regarded as of so great value, are now replaced by hyperæmia treatment, which is of benefit in reducing the sluggish congestion of swollen periarticular tissue. Operative interference is of proved value in advanced cases with marked necrosis, and the usefulness of perfected mechanisms in the prevention of deformity has been abundantly shown.

Little need be said here regarding the tuberculous invasion of other tissues which frequently come under the surgeon's care. Tuberculous periosteitis, tuberculous involvement of the glands, tuberculosis of the kidney, of the testes and the prostate, of the mesenteric glands and larynx may all be classed as surgical tuberculosis. But, like bone tuberculosis, the surgical treatment varies with the locality invaded, and needs special surgical consideration as to the question of surgical interference. In these, as in all forms of tuberculosis, the treatment of the patient's general condition should be the first consideration.

GENERAL CONSIDERATIONS.

The subject of bone and joint tuberculosis needs, in addition to the study of the results of treatment of individual cases, the broader consideration of the subject, especially the relation of the affected individual to the community, and what steps the community should take, not only for the care of the individual afflicted, but also for the protection of other individuals, especially among the poorer classes.

The first and most important consideration is: Should cases with bone and joint tuberculosis be isolated, or to what extent are they to be isolated? The fear of tuberculosis which has recently become so evident in our communities is such that the doors of many charitable institutions are closed against even bone tuberculosis. It is important, therefore, to learn to what extent there is danger to the inmates of such an institution from the presence of patients with bone tuberculosis. There can be no doubt that the danger of contagion from bone tuberculosis is greatly exaggerated, if any danger at all exists. It is not conceivable that a patient suffering from a tuberculous focus in one of the vertebral bodies, that is, in the anterior portion of the spinal column, without a discharging sinus, can serve as a source of infection. There would appear to be no danger in the admission of such patients into the wards of a general hospital or convalescent home. All these affections differ entirely from pulmonary tuberculosis, where the sputum is a ready carrier of contagion. It is to be remembered that in bone tuberculosis, where abscesses have developed, with discharging sinuses, the tuberculous process is usually accompanied by the complication of streptococcic bone involvement, which largely transforms the tuberculous osteitis into a septic osteomyelitis. It is possible that the pus-forming organisms in septic osteomyelitis may destroy the virulence of the tubercle bacillus to such an

STATE HOSPITAL SCHOOL FOR CRIPPLED CHILDREN, AT CANTON. Recreation and Education Centre of Unit.

extent that the danger of contagion is small. If any danger does exist, it can be easily overcome by the use of ordinary surgical dressings. In fact, it may be said that where common surgical care is provided there can be no danger to the inmates of an institution from the admission of patients suffering from bone tuberculosis.

It is undoubtedly of advantage in most institutions to separate children from adults, especially from those with pulmonary tuberculosis; and it is for these reasons that the surgical treatment of bone tuberculosis properly falls within the province of the children's hospitals, as by far the greater number of patients suffering from bone tuberculosis are children, and need different surroundings from those necessary for adults.

Home Care Versus Institution Care. — As the majority of these cases occur in childhood, there can be no doubt that home surroundings, when favorable, furnish the best environment for children and are much preferable to institution care. These conditions are not always possible among the poor, or even the well-to-do, and for this reason a large number of cases of bone tuberculosis need institution treatment for a portion of the time during the active stage. It must be admitted that efficient care of the patient suffering from caries of the spine or tuberculosis of the hip involves a considerable tax upon the nursing resources of the home. A compromise is possible in most instances, where a short period of institution care may be followed by intelligent home care under direction and supervision.

Convalescent Homes. — The value of these institutions in the treatment of bone tuberculosis can hardly be exaggerated. Few private homes furnish the requirements of fresh air and activity which can be given in properly regulated convalescent homes, where the conditions can be made to conform to the requirements demanded by the surgical indications of the patients. Residence

in a convalescents' home should be limited to those cases where proper home care cannot be carried out, it being an aphorism in all charitable work that it is an unwise policy to remove children from home influences.

Seashore Versus Country Convalescent Homes. — There has existed a general feeling that the sea air is especially beneficial to bone tuberculosis, which may be likened to the former belief as to the superiority of mountain air over that of sea air for pulmonary tuberculosis. It is difficult to state definitely what foundation exists for the belief in the superiority of sea air over that of pure air of internal localities. It is probable that the benefit to be derived from seashore homes is that during the hot season the heat is tempered by sea breezes, and the patients are not obliged to remain housed for protection from the intense heat. It would appear reasonable to suppose that the question of a country convalescent home or a seashore convalescent home is a geographical rather than a theoretical one. A convalescent home should be so located as to enable the patients to enjoy the benefit of pure air and a maximum of sunshine for as long a period as possible. There can be no question of the advantages of seashore homes during the hot season of the year, provided they are well protected, and allow the proper amount of freedom from any source of tuberculous contagion.

School Hours for Patients with Bone Tuberculosis. — As bone tuberculosis in its usual form requires for its complete cure a long period of time, children would be deprived of educational advantages if during the convalescent stage they were unable to attend school. Such children should not only be free from any tax upon their constitutional strength, but also from the rougher play incident to large schools. It is for this reason that special arrangement of school work is advisable for children who are suffering from bone tuberculosis in the acute or the convalescent

STATE HOSPITAL SCHOOL FOR CRIPPLED CHILDREN, AT CANTON.—Interior of Education and Recreation Centre.

STATE HOSPITAL-SCHOOL FOR CRIPPLED CHILDREN, AT CANTON.—Interior of Dormitory.

stage. This can be met by the education of these children by means of tutors, or by the establishment of special schools. Of these, two examples can be found in the Boston Industrial School for Crippled and Deformed Children, and in the Massachusetts State Hospital School at Canton. The children in institutions of this class should be furnished not only with proper instruction, but the hours of play should also be regulated and physical culture provided.

MASSACHUSETTS INSTITUTIONS FOR THE CARE OF SURGICAL TUBERCULOSIS.

The excellent facilities for the care of surgical tuberculosis at present available in Massachusetts indicate that attention has been called of recent years to the need of improved care of these patients.

The Good Samaritan Hospital has accommodations for twenty-five cases of surgical tuberculosis, and facilities for open-air treatment. It is important to note that this treatment is provided in an institution where other forms of tuberculosis and chronic diseases are also treated.

The *Boston Children's Hospital*, with an out-patient service of twenty-one thousand cases yearly, one-fifth of which may be estimated as surgical tuberculosis, contains fifty beds for surgical cases.

The *Convalescent Home* of the Children's Hospital has accommodations for seventy-five patients, from one-half to two-thirds of which are surgical tuberculosis. In co-operation with this institution is the *Day School for Crippled and Deformed Children*, on St. Botolph Street. This is supported by voluntary contributions. It was founded in 1896, and accommodates seventy-five pupils.

The Commonwealth of Massachusetts, recognizing the need of providing for the care of cases of this character, has recently established a *State Hospital School for Crippled Children*, at Canton, where

care, nursing and instruction are furnished to children who are crippled and deformed, without mental disability. The institution was opened in 1908, and furnishes accommodations for one hundred and twenty inmates.

An excellent private institution has been established in Hyde Park, where children with surgical tuberculosis are cared for. The institution, which is supported by voluntary contributions, is incorporated under the name of the *Peabody Home for Crippled and Deformed Children.* It has from thirty to forty inmates.

Another admirable institution, the *Baldwinsville Home*, at Baldwinsville, receives a certain number of children suffering from surgical tuberculosis. It is a private institution.

The *Lowell Island Seashore Home* for two months during the summer receives and cares for cases of surgical tuberculosis.

Similar care is furnished at the *Burrage Hospital*, in Boston harbor, which is open during the months of July, August and a part of September.

At present the larger general hospitals, notably the *Carney* and the *Massachusetts General* hospitals, furnish surgical care for cases of surgical tuberculosis.

Although the number of patients suffering from surgical tuberculosis cared for in the above institutions is considerable, it is evidently desirable that similar provision be made locally in all the larger cities of our Commonwealth for the early recognition of all forms of tuberculosis, and for the proper early surgical treatment as well as suitable hygienic surroundings.

Chapter X.

THE WORK OF THE COMMUNITIES THROUGHOUT THE STATE.

Edwin A. Locke, M.D.

With few exceptions, but little has been undertaken individually by the cities and towns of the Commonwealth to combat tuberculosis. The gratifying development of the widespread activity against tuberculosis in Massachusetts has been the result almost solely of the efforts of voluntary associations and individuals, and in the few instances where the community as a community has been aroused to face its responsibility in the matter, it has been in consequence directly or indirectly of previous voluntary work. The organization of these associations and their achievements have been described in Chapter XI.

The fact that the control of tuberculosis is essentially a sanitary and social problem which can be successfully solved only by the communities acting in close co-operation with all other agencies is becoming more and more generally recognized, and the next few years promise a great awakening on the part of the cities and towns of the State to their duty in this regard. Many plans for activities along the various lines are either contemplated or actually under way in many quarters of the State.

The activities of the State Board of Health and its relation to the local boards have been discussed in Chapter II. As mentioned there, in accordance with the order of the State Board of Health of August 1, 1907, tuberculosis in all its forms is included in the group of diseases considered dangerous to the community. Notification of all cases of tuberculosis to the local boards of health is therefore compulsory throughout the State.

Aside from Boston, no city or town in the Commonwealth maintains a special hospital for tuberculosis, but in three a limited number of beds is provided in the city institutions for the sick (Worcester, Lawrence and Brookline). The city of Haverhill has made provisions for the care of a small number of advanced consumptives in the discarded polling booths. Special tuberculosis clinics have been established at the Worcester City Hospital, Lowell General Hospital and Fall River City Hospital.

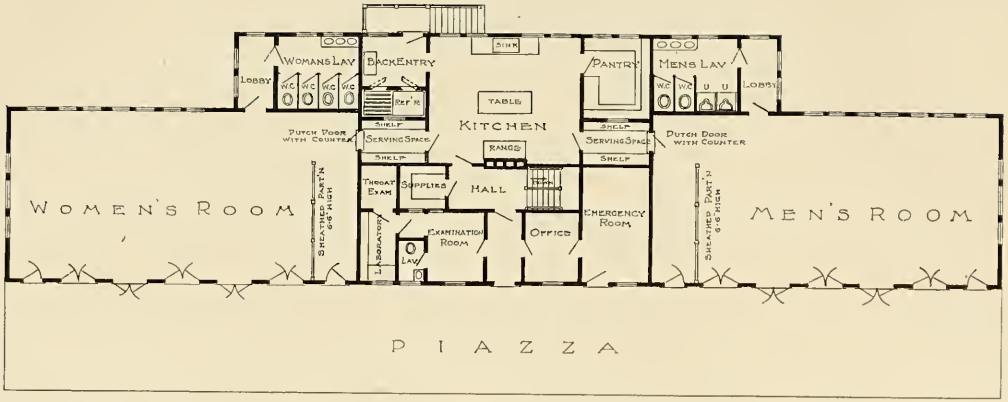
Systematic inspection of school children, in most instances combined with examination, is carried out in the following cities and towns: Andover, Brockton, Brookline, Cambridge, Chelsea, Fall River, Fitchburg, Haverhill, Holyoke, Lawrence, Lynn, Malden, New Bedford, Newton, Northampton, Pittsfield, Somerville, Springfield, Taunton, Walpole, Waltham, Ware, Winchester, Woburn and Worcester.

Early in the present year the city of Cambridge appropriated $20,000 for the erection and maintenance of a permanent day-camp for consumptives, to be under the direction of the Cambridge Board of Health. This institution was opened July 15, with a capacity for one hundred patients. The administration is under a corps of visiting physicians and a salaried resident physician. The city of Cambridge has also for the past few years through its Board of Health treated a considerable number of advanced consumptives at the Holy Ghost and other hospitals, and has furnished financial aid to residents of Cambridge going to various sanatoria.

Andover, Canton, Everett, Haverhill, Milton, Newton, Northampton and Ware have also aided needy cases going to the State Sanatorium at Rutland directly from city funds.

The results obtained in the town of Oxford are so extraordinary as to merit special mention. In a recent paper Dr. Elliot P. Joslin has given a very complete report of his careful study of the con-

DAY CAMP AT CAMBRIDGE.



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SCALE

BUILDING FOR DAY CAMP FOR OUT PATIENTS
CONTAGIOUS HOSPITAL GROUP
FOR THE CITY OF CAMBRIDGE MASS

FIRST FLOOR PLAN

CHARLES R GRECO ARCHITECT 8 BEACON STREET
BOSTON MASS

ditions there and of the results accomplished.[1] Oxford is a small manufacturing town of about three thousand inhabitants. During the period from 1851 to 1900 the average death-rate from consumption was 32.7 per 10,000 inhabitants, or considerably higher than the average death-rate throughout the State of Massachusetts. The striking decrease in this death-rate is well shown in the following table: —

PERIODS.	Total Number of Deaths from Consumption.	Number of Deaths from Consumption per 10,000 Inhabitants.
1851–55,	41	31.6
1856–60,	64	43.7
1861–65,	87	60.5
1866–70,	43	31.2
1871–75,	59	42.0
1876–80,	40	28.7
1881–85,	42	33.8
1886–90,	32	25.7
1891–95,	30	23.9
1896–1900,	25	19.7
1901–05,	19	13.6
1906,	–	–
1907,	4	13.7

The ages of those dying from tuberculosis in Oxford during 1907 were twenty-six, forty-seven, sixty-three and seventy-seven respectively, and of these four individuals one was only a temporary resident. This shows strikingly how few new cases are appearing in the town.

Although this decrease was undoubtedly the result in a large measure of such factors as the general improvement in the living conditions of the poor, it seems fair to attribute the very marked fall in the death-rate during the past seven years to the vigorous campaign carried on against the disease on the part of the authorities of the town and some of its citizens. The A. P. Joslin

[1] Bost. Med. & Surg. Jour., 1905. CLIII, 436.

Company has been especially active in investigating conditions in its factory, and in caring for any cases found among the employees. Various notices, calling attention to the prevalence of the disease, the proper measures to be taken to control it, describing the symptoms of the disease and urging all employees with suspicious symptoms to consult a physician, are posted in the factory. Relief to the families of the consumptives is given, and the firm agrees to pay the board in a sanatorium for at least three months of any case appearing among those employed.

THE ANTI-TUBERCULOSIS WORK ORGANIZED BY THE CITY OF BOSTON.

Boston is the only city in the entire State which has inaugurated a comprehensive municipal anti-tuberculosis movement. A full account of this organization was recently published in the second annual report of the Consumptives' Hospital Department of the City of Boston, 1907, and a further account in the Transactions of the National Association for the Study and Prevention of Tuberculosis, 1908, of which the following is an abstract.

The assumption of this work by the city is a direct outgrowth of the many years of splendid activity in this community on the part of many private agencies and the efforts of individual physicians.

The needs of this broader work become more evident if the conditions in Boston are briefly considered. According to the latest estimates, Boston has a population of 609,757. For the year 1907 the general death-rate per 10,000 inhabitants was 191.67, of which 9$\frac{3}{5}$ per cent., or 18.42 per 10,000, were due to tuberculosis. Chart 1 shows, in terms of the number of deaths per 10,000 inhabitants, the decrease in the death-rate from consumption since 1846. It will be seen that the past twenty-one years marks a diminution

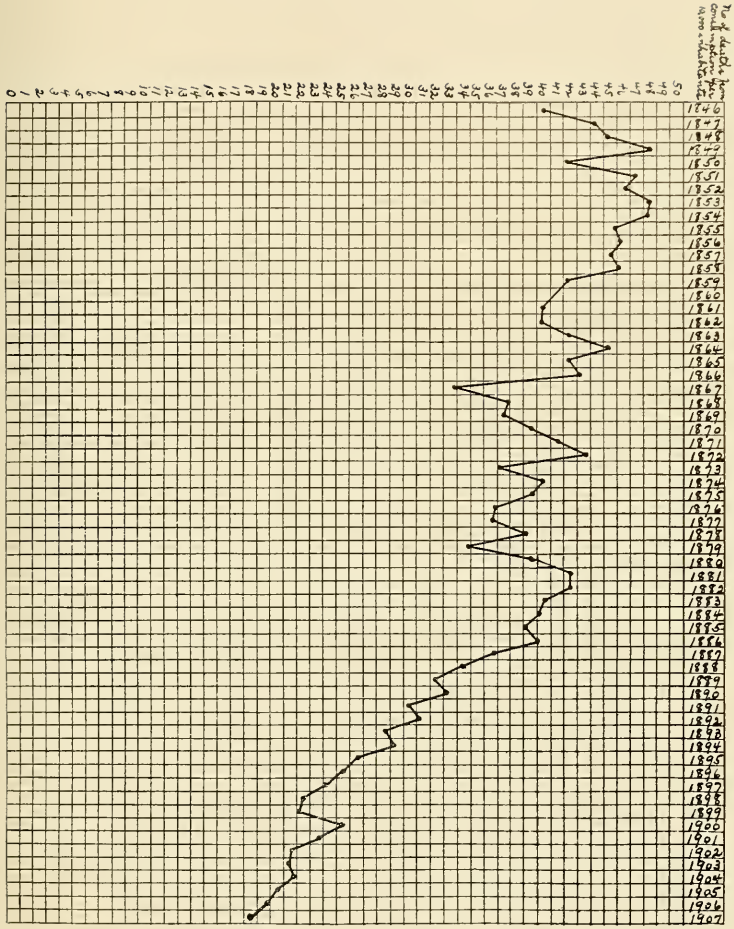


CHART I.—SHOWING DEATH-RATE FROM PULMONARY TUBERCULOSIS IN BOSTON FROM 1846 TO 1906.

of approximately 55 per cent. in the number of yearly deaths from this single cause. This decrease represents an actual saving of 14,412 lives.

In spite of this gratifying fall in the death-rate, the total number of deaths from all forms of tuberculosis in 1907 was 1,358. As is well known, this occurred largely among the poorer class. In the absence of any reliable morbidity statistics, the exact number of cases of tuberculosis in the city cannot be stated, but I believe we have sufficient basis for the estimate that there are at least 10,000 and probably 15,000 consumptives in the city of Boston. For the care of these cases, the total number of beds in all institutions for consumptives previous to the beginning of the present work was 775; 2,131 patients were treated in these beds during the year 1907, and approximately 800 were examined in the four special tuberculosis clinics.

The urgent need of greater hospital accommodations for those affected with tuberculosis has for many years been apparent, and in 1901 an appropriation of $150,000 was finally made by the city government. This sum seemed so inadequate, however, that for many years it was not made available.

The real beginning of the present work was made five years later, in the creation of a Consumptives' Hospital Department by the City Council, and the appointment of an unpaid Board of seven Trustees by Mayor Fitzgerald, who were empowered to purchase land and to erect and maintain a hospital for consumptives. As a means of affording immediate relief, pending the erection of the hospital, the Board of Trustees were authorized by a special act of the State Legislature to "hire not more than one hundred beds in private hospitals and to pay not more than five dollars a week per patient for the use of needy tuberculous patients who are residents of said city." Up to the present time

the city of Boston has appropriated $307,000 for buildings. For the maintenance of the work thus organized, the city has for the present year made an appropriation of $100,000.

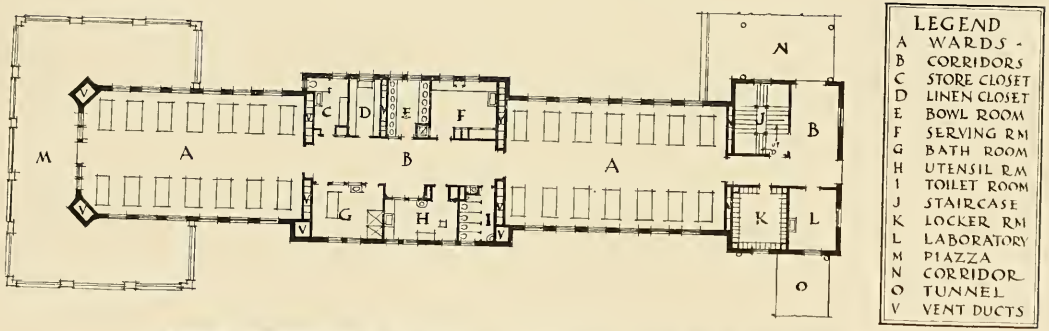
Realizing the magnitude of the task and the ineffectiveness of individual efforts, the trustees have sought to build up a comprehensive organization which shall so co-ordinate all factors in the work, both public and private, as to effectively deal with all phases of the problem. Success demands sustained efforts along many lines for a long period of years. The Boston Board of Health, the various hospitals for the care of advanced consumptives, sanatoria, special tuberculosis clinics, convalescent homes and many other agencies, such as the volunteer associations, Associated Charities (comprising over sixteen hundred different societies), churches, women's clubs, labor unions, etc., have co-operated in the fullest degree in the development of this plan of campaign.

Since the State Sanatorium at Rutland provides ample accommodations for all incipient cases, no special provision for the treatment of this class has been made. Our efforts have thus been directed along two main general lines: first, the protection of the well against infection; and second, the care of the various classes of advanced consumptives. The work undertaken may perhaps be best described under five heads: First. Clinical. Second. Educational. Third. Social. Fourth. Sanitary. Fifth. Study and investigation.

1. CLINICAL WORK.

Obviously the most urgent need has been for facilities for the care of the advanced cases, and the first efforts of the trustees have been directed toward providing such. In the spring of 1906 the trustees purchased an estate of fifty-eight acres in Mattapan, and immediately started the development of plans for a municipal hospital for advanced consumptives. The site chosen is within city limits, in a quiet suburb approximately seven miles from the

BOSTON CONSUMPTIVES' HOSPITAL AT MATTAPAN.—Elevation Plan of Ward Building.



LEGEND	
A	WARDS
B	CORRIDORS
C	STORE CLOSET
D	LINEN CLOSET
E	BOWL ROOM
F	SERVING RM
G	BATH ROOM
H	UTENSIL RM
I	TOILET ROOM
J	STAIRCASE
K	LOCKER RM
L	LABORATORY
M	PIAZZA
N	CORRIDOR
O	TUNNEL
V	VENT DUCTS

BOSTON CONSUMPTIVES' HOSPITAL AT MATTAPAN. — Floor Plan of Ward Building.

center of the city, and is readily accessible by trolley from any part of the city. The land is admirably adapted for the development of a hospital plant, and is undoubtedly the most favorable of any vacant tract situated within city limits. The general hospital scheme as planned comprises the following buildings: six ward buildings, administration, domestic and pathological buildings, chapel, laundry, nurses' home, central power station, permanent day-camp and a group of cottage wards; but because of the lack of funds, only the central power station, two ward pavilions, the day-camp, one cottage ward and a temporary domestic building can at present be built.

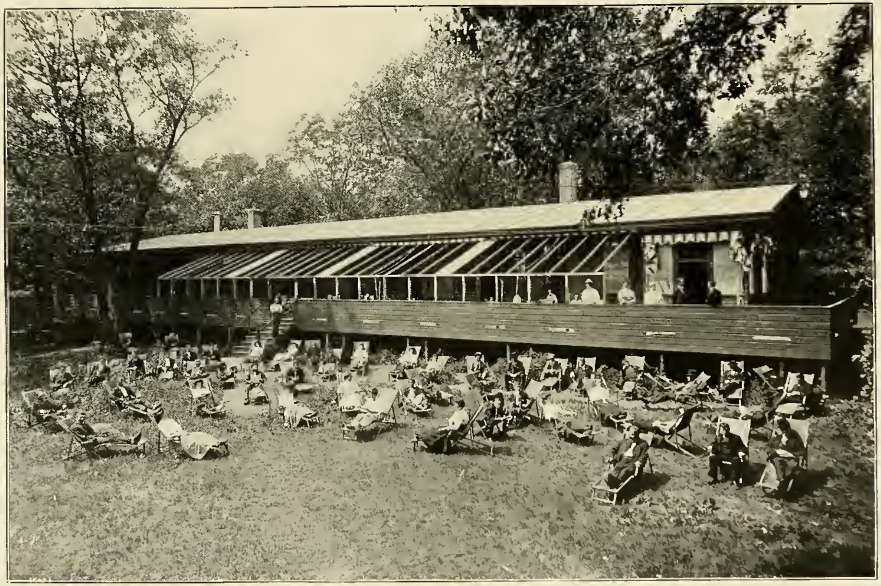
The administration of all these institutions, as well as the Out-Patient Department, to be described later, is in charge of one executive head, and the medical work under a single staff, consisting of a Chief of Staff, a First Assistant, a Visiting Pathologist, a Laryngologist and a corps of Assistant Physicians. A uniform system in the keeping of clinical records will be installed in all departments, and by a simple system of transfers these will be cross-referenced.

A. Hospital for Advanced Cases. — This hospital is designed to furnish accommodations for the care of consumptives in the last stages of the disease. Although this class represents but a small percentage of all consumptives, the building of this hospital is of the first importance, for the reason that they are the class most dangerous to the community and the type most needing hospital care. It is our purpose so far as possible to permanently detain all cases once admitted to the hospital.

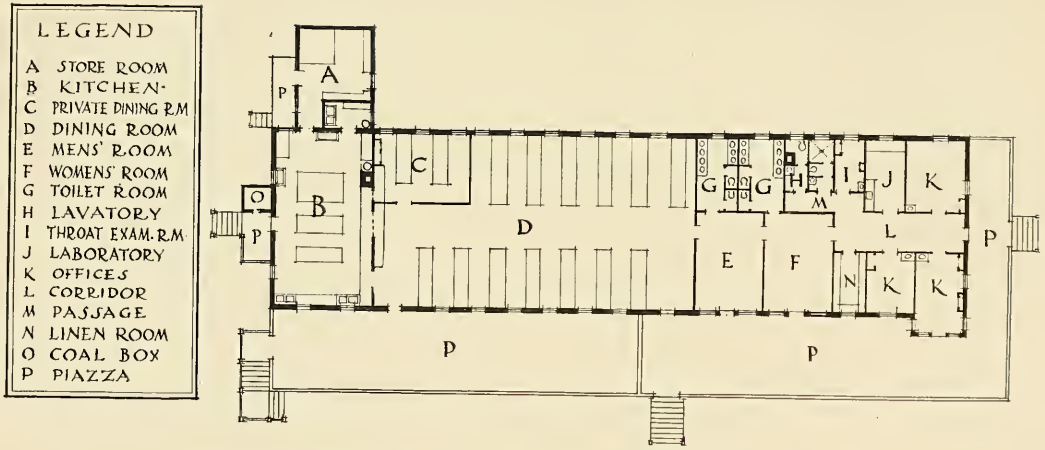
The ward buildings are of the two-story, pavilion type, placed sixty-five feet apart, connected by open corridors, and are so placed as to permit of extension by the addition of more wards to the limit of four hundred beds. Each ward building is to cost roughly $62,000, and will contain fifty-eight beds. They are of fire-proof

construction throughout, two stories high, and are arranged with a view to economy and efficiency of administration, absolute cleanliness and comfort for the patients. Their position is such as to afford a maximum of sunshine. It is expected that these wards will be completed by the end of the present year, and the accommodations which they will afford, together with those in the various institutions in the city which receive advanced cases, will, we hope, be sufficient for all destitute cases.

B. The Sanatorium Day-camp. — German statistics show that but from ten to fifteen per cent. of all consumptives are of the incipient type, and those in the most advanced stage of the disease probably comprise a no larger percentage; hence the greatest demand is constantly felt for provisions for the moderately advanced or ambulatory cases. Experience has taught us that the great majority of consumptives cannot be induced to enter a hospital, and, even were it possible, the expense in caring for so large a number would render it impossible to make provisions for them. For three years the Boston Association for the Relief and Control of Tuberculosis has successfully maintained a sanatorium day-camp for consumptives during the summer months, and their success in this special work has led us to attempt the same thing on a larger and more comprehensive scale, and for this purpose we have erected a permanent structure immediately adjacent to the main hospital. This building, which was opened early in July, 1908, is one story high, one hundred and fifty feet long, thirty-six feet wide, of rough but solid wooden construction, and unfinished on the inside. Along the south side is an open veranda one hundred by sixteen feet, provided with an overhanging roof of eight feet and awnings. The building contains a well-equipped kitchen, capable of furnishing food for a maximum of five hundred patients a large storeroom with refrigerators, a patients' dining-room seating one hundred and eighty, a small nurses' dining-room, two rest



BOSTON CONSUMPTIVES' HOSPITAL AT MATTAPAN. — Day-camp.



BOSTON CONSUMPTIVES' HOSPITAL AT MATTAPAN. Floor Plan of Day-camp.

BOSTON CONSUMPTIVES' HOSPITAL AT MATTAPAN. Dining Room of Day-camp.

rooms for patients, one for men and one for women, a thoroughly equipped laboratory, a laryngological room, a linen room, a nurses' office, a medical office and one large examining room. Steam and electricity are to be furnished from the central power station. Its beautiful situation on the edge of a small grove of oaks and sheltered to the north by high rocks and trees gives the most ideal opportunity for the rest treatment for patients. At least two hundred patients can be accommodated in this single institution. The routine of treatment is strictly the accepted sanatorium type. Patients are required to report at the camp at nine A.M., and are allowed to return to their homes not earlier than five P.M. or later than six P.M.

The medical work is in charge of a Director and an Assistant, both of whom are assistant physicians to the Boston Consumptives' Hospital. At least one of these assistants is required to be in constant attendance. A head nurse and two assistant nurses are also assigned to the work. One of the latter will devote her entire time to the members of the camp in their homes, and especially to the following up of delinquents. The same exact records are to be kept as in the main hospital. As a routine, the patient must first be registered and investigated at the Out-Patient Department before admittance to the camp.

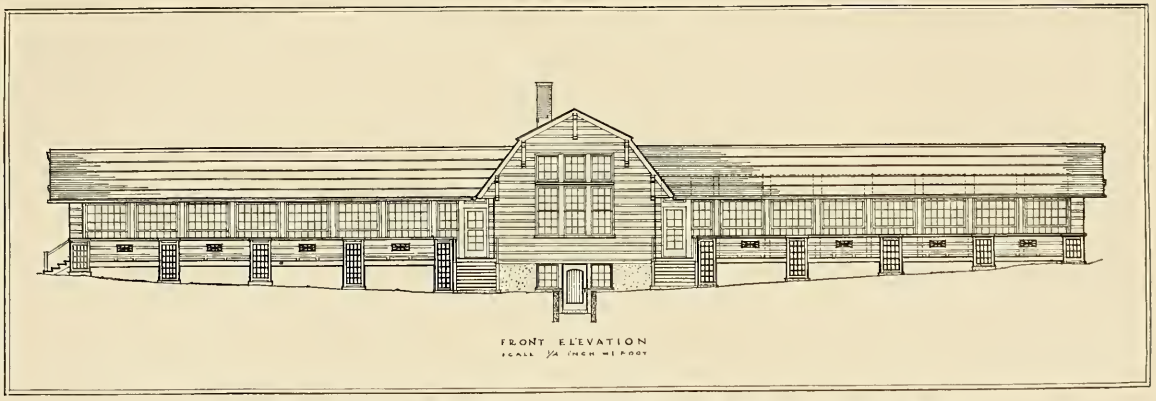
C. Cottage Wards. — Immediately adjacent to the day-camp is being erected a somewhat different type of building, to which we have given the name of "cottage wards." This type is much like the "improved lean-to's" at Liberty and other sanatoria, though of somewhat more permanent construction. It is of one story, and consists of a central portion containing a large assembly room, two locker-rooms, two shower-baths and one tub-bath, lavatories, a wash-room, an emergency ward of two beds and a nurses' room. On each side is a large open ward sixty by eighteen feet, facing to the south, the floor of which is continuous with a wide veranda

on the south side, extending the entire length. The front of each ward is closed by large windows of three sashes, which can be raised, thus opening the entire front of the ward. Likewise along the end and north side is a row of sliding windows. The entire cottage is about one hundred and fifty feet long and provides for twenty-six beds. The estimated cost is $8,000.

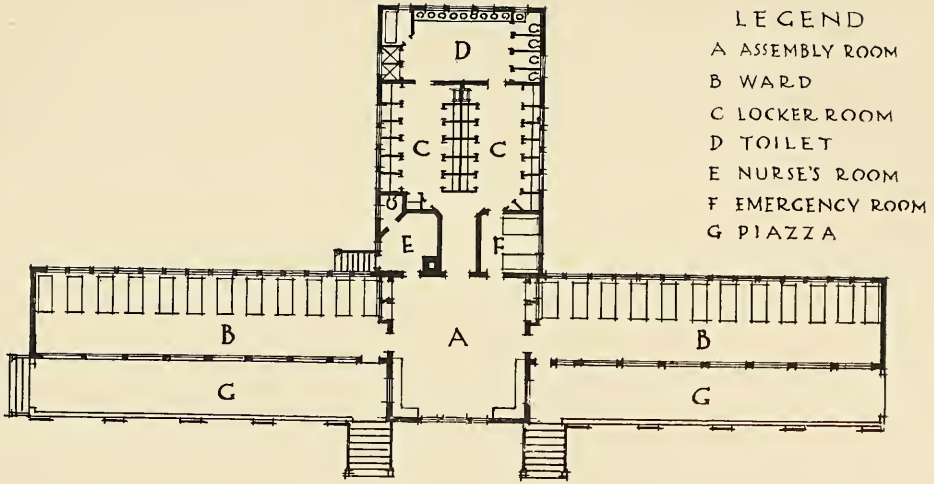
Exactly the same type of ambulatory cases will be treated here as in the day-camp, and precisely the same hygienic-dietetic régime will be followed. It is designed to care for those patients without homes, or with only such as do not offer proper conditions for the patient at night. Depending upon the success obtained in this form of treatment and the demands for hospital accommodations, it is the purpose of the Trustees to build a series of these cottages about the day-camp building as the administrative center. In our opinion, no form of home treatment, however carefully supervised, can give as good results as can be obtained with this method.

D. Work for Patients. — The plan for the care of patients in both the day-camp and cottage wards includes provision for graduated work. This will be made possible by the routine daily work to be done in the institutions and on the farm which constitutes a considerable portion of the estate. We have in mind not only to prevent the patient from acquiring habits of idleness during his treatment, but to give him the benefit of regular occupation of such nature and length of time each day as his condition permits. In other words, work will be used therapeutically.

E. The Out-patient Department (*Dispensary*). — The first department of the Consumptives' Hospital to be opened was the Out-Patient Department, the first clinic day being September 11, 1907. At present a clinic is held four mornings each week, Saturday morning being reserved for children. An evening clinic will soon be opened. The place of the dispensary in any properly organized municipal tuberculosis campaign and the best methods



BOSTON CONSUMPTIVES' HOSPITAL AT MATTAPAN. Front Elevation of Cottage Ward.



BOSTON CONSUMPTIVES' HOSPITAL AT MATTAPAN. — Floor Plan of Cottage Ward.

to be employed are so well known that I shall not dwell upon these subjects. A suitable four-story house, centrally located and accessible to the poorer sections of the city, where the greatest number of cases of tuberculosis are found, was chosen, thoroughly renovated and adapted to the needs of a tuberculosis clinic. In keeping with the idea of Philip and others, we have made this clinic the center of all activity, as will be seen from the accompanying diagram. This diagram is designed to show the close relation existing between our Out-Patient Department and all other institutions receiving tuberculosis patients. Those under our control are drawn in full line, those under other control but still associated with our work, in broken line. In a general way, the size of the circle is intended to represent the relative number of cases which each can accommodate, and the depth of line the relative importance of the individual factors. All cases except the few bed patients must first be registered and studied at the central bureau, then assigned, so far as the accommodations will permit, to the type of treatment best suited to the stage of the disease, the social and financial conditions of the patient, and the individual. The double arrows indicate that cases are not only sent from the dispensary to various other institutions, but when discharged from these are referred back to the same center. In this manner a permanent record will be kept of the patients' whereabouts and condition. I am convinced that this close supervision of tuberculosis patients is the first essential to successful control. No intelligent effective work in controlling the spread of the disease is possible without it.

A list of all cases of contagious diseases with addresses is sent to the office of the dispensary daily by the Board of Health.

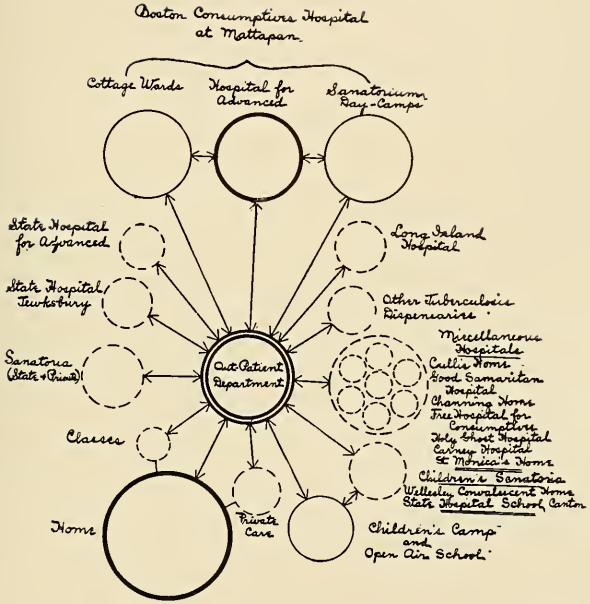
All members of the family of a tuberculous individual are systematically sent or brought to the clinic for examination. This work is principally done by the visiting nurses from our clinic.

During the past two years especially, work of this nature has been done among the children under the direction of the committee from the Associated Charities, Boston Association for the Relief and Control of Tuberculosis, and the Boston Consumptives' Hospital. For the purpose of this work the city was divided into four districts, each with its tuberculosis clinic to which the children of that district were taken. A record of all cases was sent to the Out-Patient Department of the Consumptives' Hospital as a central bureau. In consequence of the better facilities for the work and the special clinic for children maintained there, the majority of the children have been sent to the Out-Patient Department. By the application of the newer exact methods of diagnosis, we have found a surprising number of children to be infected.

All these methods above mentioned comprise what I have termed "aggressive work." Experience has convinced us that by the ordinary methods of an out-patient department, where the patients are left to come voluntarily, only a small percentage of cases is ever discovered. A considerable portion of the time of our nurses is spent in following up delinquents and in bringing individuals to the clinic for examination.

Besides the visiting physician, there are nine nurses on duty at the dispensary, four of whom are in attendance at the Out-Patient Department on clinic morning. The routine work of history taking, etc., is done by these nurses. Besides her duties at the clinic, each of the nurses is assigned a definite section of the city, and under the direction of a Superintendent of Nurses she carries out the line of work most necessary. Nothing has been so gratifying and encouraging to us as the success which these nurses have attained in their work, and we regard them more and more as the all-important agents in the work.

In spite of every provision for suitable institution treatment and the exercise of every possible influence, the majority of con-



Plan of organization of the municipal campaign in Boston, showing the relation of various institutions caring for consumptives.

sumptives cannot be persuaded to leave their homes; consequently, while relying on the hospital system now being developed at Mattapan for great relief by caring for a large number of the most advanced cases, we are nevertheless concentrating every effort on the work with the patients in their own homes done under the control of the dispensary. The cases reported to the dispensary as too sick to come to the clinic are visited in their homes by one of the dispensary physicians, or, in rare instances, by one of the city district physicians. As a rule, these are at once removed to some hospital.

A small lunch room has been fitted up in the basement of the Out-Patient Department, where those patients desiring it are given a glass of milk. Fourteen quarts are dispensed each clinic morning. We are convinced that this is a wise proceeding, especially with the children's clinic.

F. Co-operation with the State Sanatorium for After-care. — Arrangements have been made with the State Sanatorium at Rutland whereby all Boston cases discharged who were originally sent to the Sanatorium by the Boston Dispensary shall be referred back to the Boston Dispensary, and all others to the Out-Patient Department of the Consumptives' Hospital. During the year 1907 three hundred and eleven cases returned to Boston from the State Sanatorium. Through the Out-Patient Department we are now carrying on the important work of supervising this class after discharge from the sanatorium, and especially seeking to fit them to take up some occupation.

G. Special Institutions for Children. — Thus far our work among children has been restricted largely to the examination of them at the clinic and treatment in their homes. Several plans are now being considered which we confidently expect will soon make it possible to remove many from the unhygienic home surroundings, at least temporarily, to those which are more ideal. Ar-

rangements have already been made with the Trustees of the Wellesley Convalescent Home of the Children's Hospital at Wellesley, and with the State Hospital School for Crippled Children, at Canton, for the care of a considerable number of the early or suspected children. The establishment of the Day-camp for Children, at Parker Hill, during the past summer by the Boston Association for the Relief and Control of Tuberculosis has greatly increased the facilities for the treatment of tuberculous children.

2. EDUCATIONAL ACTIVITIES.

Along these lines perhaps more than any other has the best work been accomplished in the past few years, and with the relief from clinical work which our hospital has given, various organizations, such as the Boston Association for the Relief and Control of Tuberculosis, have found it possible to devote themselves more completely to the field of education. For this reason, largely, our hospital has considered it wise to participate to but a moderate degree in the work along these lines.

September 15, 1906, the following order was sent by the Mayor to all heads of departments, and by his order the appended regulations were posted in all municipal buildings: —

MAYOR'S ORDER.

To the Heads of Departments.

The National Association for the Study and Prevention of Tuberculosis recently adopted the following resolution and sent it to President Roosevelt: —

"*Resolved*, That in the interest of Preventive Medicine and the cause of Industrial Hygiene this Association respectfully recommends to the Chief Executive of the Nation the desirability of instituting an inquiry through the proper officers of the government as to the sanitary conditions existing in all government offices and workshops where a large number of persons are employed, especially with a view of recommending, if necessary, measures for the prevention of tuberculosis therein."

In view of this resolution, and in the interest of the public service, I hereby promulgate the following order, with the object of eliminating and preventing tuberculosis among the employees of the city of Boston: —

It shall be the duty of the head of each department to transmit to all employees under his control the accompanying rules and information to prevent the spread of tuberculosis, and to require the display of these rules in such manner and in such number as is necessary to carry out their intent.

It is hereby required of each department to ascertain from time to time the names of persons in service in said department afflicted with tuberculosis, and to present to them the printed rules for their observance.

The non-observance of said rules shall, in the discretion of the head of the department, be considered a just cause for separation from the service.

Whenever there is a doubt with regard to any person in the city service as to whether said person is afflicted with pulmonary tuberculosis, an order shall be issued by the head of the department for said person to present himself (or herself) at one of the city hospitals for examination, and to present the department a certificate from the superintendent or other authorized officer of the said hospital showing the result of said examination.

The Board of Health is hereby directed to cause a thorough sanitary inspection of the public buildings and workshops under the various city departments; and said Board is authorized to detail from its respective medical services a Sanitary Board, or Boards, for this purpose. The Sanitary Board thus appointed shall report upon: —

First. — Unsanitary conditions immediately remediable.

Second. — Unsanitary conditions requiring structural changes.

The said Board when entering upon its duties in any department shall report to the executive head of said building or workshop, who shall, on the request of the Board, give such assistance as may be required.

The Sanitary Board shall make reports to the Board of Health, and said Board of Health shall transmit a full report with recommendations to the Mayor.

These duties to be additional to, and not to take precedence of, the duties of the Board of Health prescribed by ordinance.

Regulations to prevent the Spread of Tuberculosis in Municipal Buildings, Offices and Workshops.

1. All employees of the city of Boston are positively forbidden to spit upon the floors.

2. Rooms, hallways, corridors and lavatories shall be freely aired and effectually cleaned at least once a day, and not during working hours.

3. Spittoons shall receive a daily cleansing with very hot water, and when placed ready for use must contain a small quantity of water.

4. Dust must be removed as completely as possible by means of dampened cloths or mops. It should never be needlessly stirred up by a broom or duster, as this practice only spreads the dust and germs.

5. Floors of tiling, brick or stone must be frequently scoured with soap and water.

6. The senior clerks in charge of workrooms shall take measures to secure during working hours the admission of as much fresh air and sunshine as the conditions will permit.

7. The use of individual drinking glasses is recommended.

8. Persons in the employ of the city of Boston who suffer from pulmonary tuberculosis shall be separated when possible from others while at work, and they should be cautioned to use telephones only when necessary.

9. Such persons will not be permitted to use the public spittoons, but must provide themselves with individual sputum receivers, preferably of easily destructible material, and carry these with them on arrival and departure. They will be held strictly responsible for the disposal and destruction of their own sputum, so that no other person's health may be endangered therefrom.

10. Such persons must provide their own drinking glasses, soap and towels, and shall not use those provided for the general use.

11. Plainly printed notices, reading as follows: "Do not spit on the floor, to do so may spread disease," shall be prominently posted in rooms, hallways, corridors and lavatories of public buildings.

JOHN F. FITZGERALD,

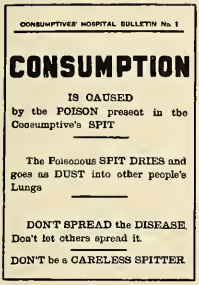
Mayor.

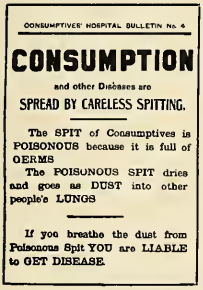
September 15, 1906.
Circular 14.

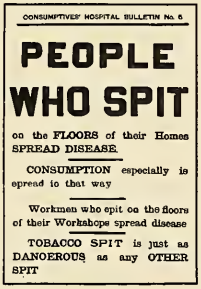
Subsequently a small pamphlet, entitled "Tuberculosis," and containing the following concise chapters, "The nature of the disease," "Its danger and sources of contagion," "How to prevent it," "How to cure it," and "Advice to the sick and the well," was prepared by the Trustees and mailed to every voter in Boston.

During the year 1907 two hundred large posters, eight by nine feet, reading as follows: —

CONSUMPTIVES' HOSPITAL BULLETIN.
SPITTING
SPREADS
DISEASE.
POISONOUS SPIT DRIES AND GOES
AS DUST INTO OTHER PEOPLE'S LUNGS.
CONSUMPTION
IS SPREAD
IN THIS WAY.
DON'T BE A
CARELESS SPITTER.
TOBACCO SPIT IS JUST AS
DANGEROUS AS ANY OTHER.







BULLETINS POSTED BY THE BOSTON CONSUMPTIVES' HOSPITAL.

were displayed free of charge by John Donnelly & Sons, bill posters, on bill boards in various sections of the city.

To supplement the Board of Health signs and with the consent of the health authorities, the trustees during the past year also issued a series of six bulletins, printed on yellow metal sheets similar to those in use in Yonkers, ten by fourteen inches. These are now systematically posted in all railway and subway stations, steamboat wharves, public buildings, many of the freight docks, and in lodging and tenement houses. Almost daily calls are received from landlords and employers for these bulletins.

The daily papers have been encouraged and aided to publish frequent articles and editorials regarding some general topics on the subject of the work of the Consumptives' Hospital.

The most important and far-reaching educational work has obviously been done in the course of the daily visitation of consumptives in their homes by the dispensary nurses.

3. SOCIAL WORK.

Believing the tuberculosis problem to be more social than medical, we have in our organization sought to make ample provision for this phase of the work. The conditions under which the poor live are of as much if not even greater importance than contagion itself in determining the prevalence of the disease, and offer far more difficult obstacles to be overcome. Upon our nurses who have the supervision of the patients in their homes has naturally fallen the burden of the social investigation and the administration of relief. The present Superintendent of Nurses, herself a trained social worker, was chosen with a view to especially directing this work. Under her supervision the nurses are given a systematic training along social lines by means of regular reading, lectures, conferences and personal instruction. On the day following the first visit to the dispensary, each patient is visited in his home by a clinic nurse, and a thorough investi-

gation is made of the social and financial conditions. A report of these investigations on a printed form is filed with the clinical history.

We have constantly sought aid and counsel of the Associated Charities. Their valuable records are always open to us, and assistance to patients is seldom given except after the most thorough investigation by this organization and with their advice. If, after conference with the Superintendent of Nurses and the Director of the clinic, it seems necessary to give relief, a conference is held with the representative of the Associated Charities and the case further investigated by them. Each week the nurses attend the conference of the workers in the Associated Charities for their particular district. One of the first duties of the nurse is to become familiar with the various charitable organizations, societies, churches, etc., in her particular district, to whom she can turn for assistance.

After careful consideration, we have settled upon the policy of seeking as far as possible to give relief through already existing channels, for we believe it can thus be done more wisely and economically than through a special department of our own. In only one respect have we departed from this principle. The Consumptives' Hospital has undertaken the dispensing of milk to needy cases free of charge, the expense of this charity being met from our fund for maintenance. For the past few months the amount dispensed gratis in this way has been about eight thousand quarts per month. In spite of the enormous scale on which this particular form of relief is carried on, investigations by the Associated Charities of our list of cases receiving it indicate that but an insignificant part has been unwisely given.

Our dispensary is soon to benefit by the services of an expert social worker, who shall give her entire time to the study of various social problems arising in our work.

In every way possible we have striven to stimulate all efforts to improve the dwellings of the poor, the workshops, etc., which have such an important bearing on the spread of tuberculosis.

4. SANITARY SURVEILLANCE THROUGH THE BOARD OF HEALTH.

Realizing that success must ultimately depend upon the thoroughness and efficiency with which sanitary surveillance is carried out, the Consumptives' Hospital, though organized as an independent department, is working in the closest accord with the Health Department of the city of Boston. The Board of Health is conducting effective work along the following lines: —

1. Inspection and registration of all cases of tuberculosis is compulsory.

2. Medical inspection of all reported cases is systematically carried out.

3. Obligatory free disinfection is done after the death or removal of every consumptive.

4. Promiscuous spitting is prohibited, and signs to that effect and calling attention to the penalty for violation of this law are posted by the Board of Health in all public places.

5. A bacteriological laboratory is maintained for the free examination of sputa, throat cultures, etc. During 1906, 23,850 examinations were made, of which 3,602 were for tuberculosis.

6. An excellent system of inspection of schools and school children is in force. This work is done by eighty physicians regularly appointed as inspectors of schools, and twenty school nurses.

7. The health authorities are given power to forcibly remove and detain in a hospital any case of tuberculosis deemed dangerous to the community.

5. STUDY AND INVESTIGATION.

Many questions still remain to be studied, especially along the lines of the best methods of municipal control, and these, together with the study of clinical and laboratory problems, are included in our program. We believe that the study of scientific problems of this particular nature, of the best methods suited to their successful solution and of our results obtained should go hand in hand with pure clinical work. The municipality should as properly furnish funds for these investigations and for the establishment and maintenance of laboratories as for the care of patients.

Unfortunately, the necessity for stimulation to better instruction in our medical schools is daily apparent, and we are accordingly placing our clinical material at the disposal of clinical teachers.

CHAPTER XI.

THE WORK OF THE ANTI-TUBERCULOSIS SOCIETIES IN THE STATE.

Arthur K. Stone, M.D., and Walter E. Kreusi, B.S.

The development of a public sentiment in favor of a general effort to control tuberculosis has been very different in the various communities throughout the State. In many cases the work has originated in the persistent preaching of some prophet who has talked in season and out of season upon the importance of this subject. Sometimes this individual has been a physician, sometimes a layman. Several of the most important steps which have been taken by the legislative bodies of the State and in the municipalities have been started by public-spirited, far-sighted politicians, apparently unsupported by any public sentiment. In some instances the local board of health has been active and persistent, until at last it has aroused a public sentiment which would support it in its plans for the protection of the public. In still other cases groups of private citizens have met and devised ways and means to insure the enforcement of the existing laws by their local boards of health or other municipal executives.

Dr. A. T. Cabot, when president of the Massachusetts Medical Society, devoted much time to arousing the local medical societies to the importance of the tuberculosis problem. Recently the initiative in the tuberculosis campaign has come from the Associated Committees of the Massachusetts Medical Society organized through his efforts. This work among the members of the medical profession has been of great value, because the public was becoming better educated in regard to the subject of tuberculosis than were the natural leaders, the physicians.

Very frequently some public-spirited individual, seeing the importance of the movement, has arranged for an exhibit or lecture, and paid all expenses, hoping thereby to arouse public interest. In still other instances the Social Service Department of the Massachusetts General Hospital has called the attention of the charity workers of various communities to their need of organization by the repeated reference to these charity workers of cases of tuberculosis for which it was the duty of the town or city to provide.

In whatever manner the enthusiasm for the tuberculosis work has been aroused, it has almost always crystalized itself into the formation of a new association, whose sole function it is to deal with this particular problem, or in a few instances in the formation of a special committee or a pre-existing charity organization or district nursing association.

The comprehensiveness and precise nature of the work of the new association has naturally varied within wide limits, depending on many factors, but chiefly on, first, the existing conditions in the community relative to the number of cases, etc., and second, the type and extent of the work and the activity of the city or town officials. Naturally in those localities where provisions have been made by the community for the care of the sick and for adequate sanitary surveillance, the activities of these voluntary societies have been largely along the various lines of education and relief. Where no provision has been made, the functions of the associations have extended over practically the whole field, and may be roughly grouped to include the following: —

1. Education.
2. Co-operating with town or city authorities to carry out laws and ordinances.
3. Promoting legislation.
4. Registration of cases.

5. Maintenance of clinics, day-camps and classes.

6. Home supervision through visiting nurses or voluntary visitors.

7. Relief in the homes.

8. Systematic examination of members of the families of consumptives.

9. Furnishing funds for the treatment of the consumptives in institutions or in proper surroundings.

10. Seeking suitable employment for consumptive workingmen.

Besides the strictly anti-tuberculosis societies, many others, such as the district nursing associations, church societies, women's clubs, labor unions and various charitable organizations, have contributed much to the movement, chiefly, however, in educating the public and providing relief. In this chapter, however, only those associations or committees which have been formed for the specific purpose of combating tuberculosis will be considered.

The general idea of the place in the community which such an association should occupy can be best presented by a somewhat careful study of the problems that have confronted the pioneer association, the Boston Association for the Relief and Control of Tuberculosis, since its organization five years ago, as it has furnished the model for all other similar organizations in the State.

The Boston Association for the Relief and Control of Tuberculosis was founded in 1903 and incorporated in 1905. This organization had its origin in a self-appointed committee, which had been specially active in the winter of 1900–01, and had had much to do with the movement which led to the appropriation of $150,000 by the city of Boston for a Municipal Hospital for Consumptives. Mayor Hart gave his thorough approval to the movement. The original order was introduced into the City Council by Mr. O'Toole of South Boston.

The advent of Mayor Collins, however, brought the progress of the development of a new hospital to a standstill, for the reason that he considered the sum inadequate to the purpose. The committee continued to meet to discuss the tuberculosis problems of the city. It was composed of members from the medical profession, the Associated Charities, the Instructive District Nursing Association, the Women's Educational Union and the Massachusetts Emergency and Hygiene Association. It was early recognized by some of the workers that the field was so large that in spite of the many societies for special objects already in the city there was need of a new society which should devote its energies exclusively to the tuberculosis problems, as it was evident that none of the existing societies could take on the new work, which was assuming large proportions.

The active work of the Association is determined by an Executive Committee of ten, consisting of the officers and six additional members. The committee meets every two weeks through the greater part of the year. Matters of general policy are discussed at council meetings held from time to time through the winter. The council has fifty members, and in its membership are included many of the best-known citizens of the city.

The permanent committees having the active direction of the many lines of work number five, and are: Executive Committee, Finance Committee, Committee on Education and Hospitals, Committee on Relief and Control, Committee on Day-Camp.

A salaried secretary devotes his entire time to the immediate direction of the work, and a nurse is also constantly employed.

Financial support is derived entirely from voluntary contributions and the annual dues from its nine hundred members. The gross disbursements by years are as follows: —

1904,	$4,415 57
1905,	9,959 10
1906,	12,754 65
1907,	18,697 21

As the first association of its kind in the State, the Boston Association has done much to arouse public sentiment throughout the Commonwealth to an appreciation of the importance of the tuberculosis work. Previous to its formation even the Massachusetts Medical Society had taken no action on this important subject. Therefore, much of its early work was devoted to arousing the officials of the city and State to recognize the existing needs. This dealing with the legislators, both state and municipal, and with the boards of health, boards of hospital trustees and charity organizations, both in and out of the city, has required much tact and thorough appreciation of the general problem on the part of the secretaries and other members of the Association who have been called upon to do this work. While the entire credit for the results which have ensued by the above work cannot be given to the Boston Association, yet in a large measure many of the steps in advance made have been taken as the result of its efforts. Among the most important of its achievements is the aid which it has given in bringing about the organization of the Boston Consumptives' Hospital and its comprehensive plan of work. Several of the measures passed by the State Legislature were proposed by the Association, and in all instances its influence has been freely given in support of worthy legislative bills dealing with the tuberculosis problem.

The Boston Board of Health already occupied an advanced stand on many of the positions necessary for the fight against tuberculosis when the Boston Association came into existence. A municipal laboratory was in operation, and free examination

of sputum was made. Tuberculosis was recognized as a contagious disease, and, although registration was required, it was not, nor is it to-day, sufficiently enforced. Hence the registration which has been attempted is still imperfect. The recognition of tuberculosis as a disease dangerous to the public was carried to its logical conclusion by the Boston Board of Health before 1901 by the forcible removal of uncleanly and dangerous patients to the Municipal Hospital on Long Island. So far as is known, this was the first board of health in the world to take such action. A system of school inspection had also been instituted, and many important ordinances passed by the city government. In many instances public opinion did not support these measures, but so far as has been possible from the funds at the disposal of the Board, and when not restrained by adverse executive action on the part of the mayors, the Board have given steady support to the enforcement of the ordinances, as their attention has been directed from time to time to flagrant infractions of the same. There has resulted a general strengthening of the power given various city officials in consequence of the action of the Association in constantly urging them to greater vigilance and co-operation.

The same general statements apply to the State Board of Health regarding its interest and co-operation in the organized effort against tuberculosis.

For the past two years the local provisions, through clinics, day-camps and hospitals, for the care of the consumptive poor, have increased rapidly, very largely, we believe, as a result of the information in regard to the pressing needs of the community and the supporting public sentiment that has been aroused by the work of this Association.

In the beginning, a campaign of education was inaugurated. The Central Labor Union of Boston was addressed, and its co-

CULLIS CONSUMPTIVES' HOME AT DORCHESTER.

operation secured in arranging for lectures before individual labor unions. During the first year alone (1903–04) 10,500 people attended the eighty-two lectures given before these unions. These lectures were delivered by physicians active in the cause, and were in many instances illustrated by stereopticon demonstrations. A series of lectures was given in the Roman Catholic churches during Lent, the first lecture being in the Cathedral. These lectures had the special sanction of the Archbishop, and large audiences were secured. In addition, lectures were also given wherever audiences could be secured, in all several hundred being held, which were attended by nearly one hundred thousand persons.

Several hundred thousand pamphlets and circulars, among them "A War Upon Consumption," "Friendly Advice to Consumptives," "Protecting the Healthy from Tuberculosis," "Combating the Great White Plague," "The Modern Crusade Against Consumption," and other special publications, have been distributed. Assistance has been freely given in the preparation of various other circulars which have been distributed by other societies and by the municipality. Many thousand placards have been furnished employers for display in their factories and workshops.

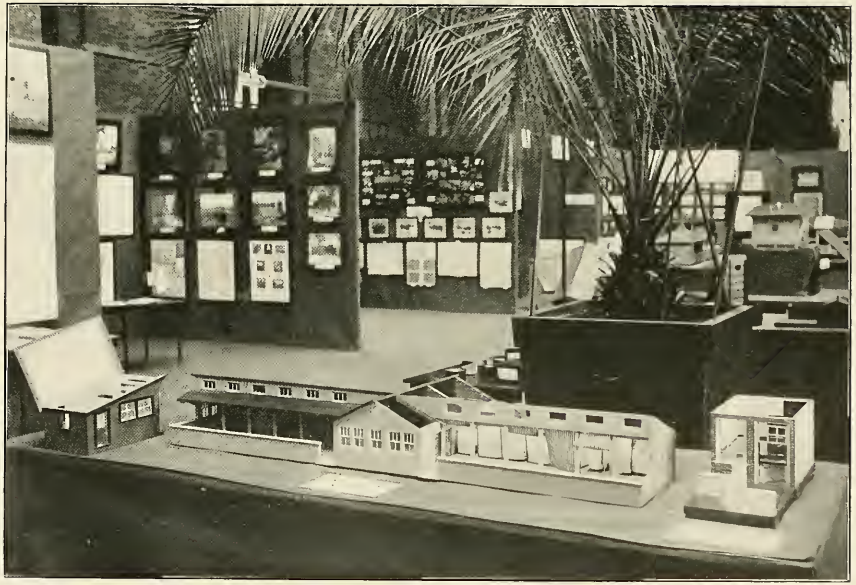
One of the most effective ways of reaching the public is through the daily newspapers, and these, in Boston especially, have generously co-operated in the educational work by the frequent publication of material furnished by the secretary of the Association; and their active support of the day-camp and other enterprises of the Association has been of most material assistance.

In 1904 a small exhibit was made by the Association at a fair which was held at Mechanics Hall. The tents and various methods of out-door life attracted so much attention and the people seemed so eager for information about tuberculosis that it was deemed

advisable that a larger and more complete exhibition should be held. The Boston Association thereupon petitioned the General Court that an appropriation should be made for the State to hold an exhibit under the auspices of its Board of Health for the general instruction of the people. The State Board of Health readily adopted the idea, and held a most successful exhibit in January of 1906, with a total attendance of about twenty-six thousand persons. Meantime the small exhibit of the Association had been travelling about the country doing missionary work, going to Springfield, Mass., to Concord and Manchester, N. H., Burlington, Vt., Newport, R. I., New Haven, Meriden and Waterbury, Conn., and finally to Scranton, Pa.

Immediately after the close of the State Tuberculosis Exhibition a compact travelling exhibit, arranged to demonstrate in a practical manner facts regarding the nature of tuberculosis, its mode of spread, and the best methods of prevention and treatment, and consisting of maps, charts, models of tents, shacks and sanatoria buildings, photographs and stereopticon slides, was prepared. In many instances the materials were the same or duplicates of the State Board of Health's exhibit. This has been shown in many different wards of the city, where it has been visited by the school children of certain grades under the escort and direction of their teachers. When not in use in Boston the exhibit has visited no less than thirty-seven other cities and towns in Massachusetts. Four times it has passed beyond the state limits, *i.e.*, to Providence, R. I., Pittsburg, Pa., Manchester, N. H., and Syracuse, N. Y. In each case the exhibit was continued from a few days to a week, and was supplemented daily by lectures on some important phase of the subject. In all nearly one hundred thousand persons have seen it. The direct fruits of the exhibit are shown by the subsequent formation of associations in many of the towns to which it has been sent.

TUBERCULOSIS EXHIBIT OF THE BOSTON ASSOCIATION.



TUBERCULOSIS EXHIBIT OF THE BOSTON ASSOCIATION.

The co-ordination of the work of all societies which can in any way contribute to the general organization has always been one of the chief aims of the Boston Association. Through its direction many of these have given valuable assistance, and the co-operation of all in their varied lines has made it possible to cover with considerable success the whole field of the work.

Co-operation represents the method by which much of the relief work is carried on. Either by this means or directly through the funds of the society, many patients have been aided to enter the institution best suited to their needs, and in many cases the patients' family has been provided for. Where it has been necessary for the patient to receive care in his own home, the proper aid has been given. Direct supervision of this branch is in the hands of a visiting nurse who is permanently in the employ of the Association. She is detailed to attend the examining clinic of the State Sanatorium, where she sees all applicants, advising those who are accepted regarding necessary preparations and equipment, and especially getting in touch with the two-thirds of the applicants who are rejected. During the year 1907 the visiting nurse made 1,443 visits and interviewed and assisted 1,493 persons. In spite of the comprehensive program now carried out by various agencies in the city, the Association nurses still find much to do in investigating and in visiting cases which as yet have not come under the care of any special society or clinic. The different forms of relief are too numerous to enumerate here, but the following summary of the disposition of six hundred and thirty-three cases for a single year will suggest its scope: —

Disposition of cases reported: —	
Gave instruction and advice to,	281
Aided in securing admission to the State Sanatorium at Rutland,	44
Aided in securing admission to the Sharon Sanatorium,	2
Aided in securing admission to hospitals and homes for advanced consumptives,	22

Aided in securing admission to public institutions,	21
Sent to the day-camp at Mattapan,	58
Referred to the District Nursing Association for continued nursing at home,	52
Referred to various private charities for relief,	63
Referred to the Board of Health for removal, or for the correction of sanitary abuses,	38
Wrong addresses, moved, etc.,	52
Total number reported,	633

Until the responsibility was assumed by the Boston Consumptives' Hospital and the Boston Dispensary, the visiting nurse also had supervision over all Boston cases discharged from the State Sanatorium.

It has been the established policy of the Association to undertake any new piece of work which seems pressing, and to carry it forward until it is demonstrated that the work is necessary, then other societies or the municipality are usually found ready to carry it on, and the Association immediately withdraws and seeks other fields of usefulness. In accordance with this policy, it has undertaken a number of investigations into the condition of various groups of persons afflicted with tuberculosis, or into special conditions existing in certain sections of the city or in certain trades and workshops, or into the conduct of certain institutions. The results of these investigations have been frequently shown to the persons only who are able to correct abuses that were found, or to help improve institutions already doing excellent work.

A central registration bureau was early organized, and has been maintained up to the present time. All known cases of tuberculosis are regularly referred to the Association by the Board of Health and the various tuberculosis clinics, and from these all possible information is recorded regarding the patient and particularly his whereabouts and the special measures which have been taken for his relief. The catalogue now includes nearly ten thousand cases.

DAY-CAMP OF 1907 AT MATTAPAN.—Maintained by the Boston Association.

CHILDREN'S DAY-CAMP AT PARKER HILL. — Maintained by the Boston Association.

Much has been done in the systematic investigation of the children of tuberculous families, and in studying the social and home conditions of the tuberculous generally.

The Association organized, in the spring of the present year, experimental classes for school children having tuberculosis, or who are especially exposed to infection. Its purpose has been to teach home and personal hygiene, cooking for the sick, and the practical use of out-of-door exercise to children who particularly stand in need of such knowledge. The work has been popular with the children, and permission to attend the classes has been eagerly sought.

To obtain suitable employment for the cases that have been discharged as arrested from the various clinics is a very perplexing problem. Much effort has been expended by the staff of the Association upon individual cases. Recently a committee representing various organizations has been assembled to consider what may be done to meet this pressing need.

In 1905 the first sanatorium day-camp for consumptives in America was started by the Association through the persistent effort of its secretary, Mr. A. M. Wilson. For two years the camp was held on the grounds of the Robert Brigham Hospital on Parker Hill, and in 1907 on the grounds of the Boston Consumptives Hospital at Mattapan. The daily cost per patient was diminished each year, being as follows: for 1905, 83 cents; for 1906, 60 cents; and for 1907, 52 cents. The total expense of the camp during the three years amounted to over $18,000. The Association so completely demonstrated the absolute need of the camp as a factor in the care of consumptives in a city, that the Municipal Hospital has undertaken to carry on the work as a permanent part of its institution. The day-camp idea has also been adopted by many other localities.

During the present season the Association is maintaining a day-camp for children on Parker Hill.

Such in brief is an outline of the activities of the Boston Association for the Relief and Control of Tuberculosis. Many and perplexing questions have been presented to the attention of the Executive Committee, unwise enthusiasm has at times been checked and greater enthusiasm and zeal at other times developed. The evils attendant on the movement have been met as far as possible. Public nominations at times have been made at the request of officials and at other times insisted upon to officials. The work has been varied but continuous, and practical encouragement has been held out to almost every real worker in the cause.

Many communities have district nursing associations, efficient women's clubs and other methods of caring for the sick and needy of the town or city, and are doing much good work, as stated above; but the following list of cities and towns have distinct organizations or special committees for the tuberculosis work: —

ANDOVER.

The Andover Tuberculosis Committee; organized in 1908. President, Mr. A. E. Stearns; Secretary, Miss A. P. Hincks, 183 Main Street.

The principal work so far accomplished has been a series of lectures upon tuberculosis, for the purpose of arousing public sentiment and raising money for a visiting nurse.

Cases of tuberculosis, known to the physicians of the town as needing assistance, are referred to the committee, and are then seen in their homes by the nurse or volunteer visitors. Relief work is carried out by the Andover Guild. The town helps worthy cases to go to Rutland, and the Board of Health cooperates with the committee in its disinfection work. It is intended to develop the relief work and to extend the educational work by further lectures upon subjects of general hygiene as well as tuberculosis.

BOSTON.

The Boston Association for the Relief and Control of Tuberculosis; founded in 1903; incorporated in 1905. President, Edward O. Otis, M.D.; Secretary, Walter E. Kreusi, 4 Joy Street.

(For a report of the work of this Association see first portion of this chapter.)

BROCKTON.

The Brockton Anti-Tuberculosis Society. President, Mrs. B. B. Russell; Secretary and Treasurer, Mr. Herbert Tinkham; Medical Director, F. J. Ripley, M.D.

The active work of the society has been in maintaining an examining clinic and in the relief work which has developed therefrom. In the course of the year thirty-four persons have been looked after either in their homes, where the cases were advanced, or aided to go to Rutland when this has been possible. A class is conducted for early cases in connection with the clinic. The relief and nursing work has been carried on by the society nurse, for a portion of the time by a visiting nurse. Educational work has been carried on by the distribution of leaflets to every home in the city. Striking results are already evident.

The funds for the support of the society have been supplied by the Hon. W. E. Douglas.

Extension of the educational and relief work will be carried on, and the problem of suitable employment for the arrested cases returning from Rutland will occupy the attention of the society.

BROOKLINE.

The Brookline Anti-Tuberculosis Society; organized in May, 1907. President, Mr. Moses Williams; Secretary, Miss Hilda W. Williams, 35 Walnut Place.

Brookline is one of the few communities where the health authorities have been active leaders in the tuberculosis work. The

principal work of the society during its first year has been educational in character. An exhibit was held and a series of illustrated lectures given. As a result, the society has more than three hundred members, and an auxiliary department started among the school children numbers more than nine hundred.

Where the town funds cannot be called upon to do so, the board of needy consumptives at the sanatorium has been furnished. A "sanitary visitor" is employed to go about among the homes, giving necessary instruction in hygiene. Recently (1908) a day-camp sanatorium has been opened, and with it a school of outdoor life for children having incipient tuberculosis.

The school inspection, registration of tuberculosis cases and disinfection are well looked after.

CAMBRIDGE.

The Cambridge Anti-Tuberculosis Association; organized in October, 1903. President, Eugene A. Darling, M.D.; Secretary, Miss Mabel L. Greeley, 689 Massachusetts Avenue.

This is one of the earliest associations organized to deal with the tuberculosis problems, and its work, centring in a community of about one hundred thousand inhabitants, has been of the greatest value. It is supported by voluntary contributions of the members, and during the last year the running expenses of the association were $2,125, and the relief work among the tuberculosis cases amounted to $1,230.

The educational work has been pushed till there is active support among the citizens at large and efficient co-operation on the part of the municipal authorities. The Association has maintained a separate index catalogue of the cases of tuberculosis, and the Board of Health has a catalogue and an index map.

The Association maintains a free tuberculosis clinic, which is open two mornings and one evening each week. Half the time

SLEEPING BALCONY USED BY CLASS PATIENT IN HAVERHILL.

of a visiting nurse is at the disposal of the Association in its relief work. A tuberculosis class is maintained, under the strictest rules.

Recently the Board of Health has secured ground for a hospital for the care of tuberculosis, and has opened a day-camp. Advanced cases have also been cared for in the Holy Ghost Hospital.

CHELSEA.

The Chelsea Anti-Tuberculosis Association; organized in June, 1907. President, Mr. Thomas B. Frost, 8 Tudor Street, Chelsea.

The work in the educational line has been confined to an exhibition and some public lectures. The principal work has been in dealing with individual patients. A clinic has been started at the Frost Hospital. After the disastrous fire of April, 1908, the clinic was continued on the Carter Street grounds. No regular nurse is employed in the relief work, but volunteer visitors look up the cases and see that they have the necessary assistance.

CLINTON.

The Clinton Anti-Tuberculosis Association. President, Dr. W. P. Bowers; Secretary, Miss Ellen K. Stevens.

The Association was formed in June, 1908, after an exhibition had been held under a special committee largely composed of the physicians of Clinton. It is supported by membership fees and contributions. It expects to co-operate with the Board of Health in seeing that the State laws are enforced. Plans are being made to establish a day sanatorium and to undertake an educational campaign.

EVERETT.

The Everett Association for the Relief and Control of Tuberculosis; organized in the spring of 1908. President, A. A. Jackson, M.D., 357 Broadway.

The organization of this society was a result of the interest aroused by a series of lectures given under the auspices of the Board of Health. A register of all cases reported to the Board of Health is being kept. The Association's present main object is to maintain a clinic and a nurse, so as to render efficient aid to the consumptives residing in Everett.

FALL RIVER.

Fall River, although the third largest city in the Commonwealth, has no private organization for the protection of the public against tuberculosis. In the city hospital a small provision for tuberculous cases is made and the city has been authorized by the legislature to build a large hospital especially for such cases. Individuals have succeeded in getting outdoor sleeping provisions for a few cases. Indigent persons may obtain attendance of the city physician in their homes. The District Nursing Association also does all in its power to assist patients in their homes.

FITCHBURG.

The Fitchburg Society for the Control and Cure of Tuberculosis. President, Mr. Alvah Crocker; Secretary, Miss Susan M. Turner, 145 Main Street.

An exhibition was held in December, 1907. The relief work is carried on by a visiting nurse. A registration map is planned for, in order that the location of the patients shall be fully known. The principal branches of work are along instructive and preventive lines. Every member of the family is examined where there is or has been a case of tuberculosis. The Board of Health has been urged to do more thorough fumigating and to more carefully inspect the sanitary condition of houses, and also to furnish temporary aid for indigent cases. The program for further activity is to have a day-camp and free clinic for adults and children. The

POLLING BOOTHS USED FOR CONSUMPTIVES AT HAVERHILL.

society aids indigent persons to pay their board in a sanatorium where that treatment is desired, and furnishes milk, eggs, awnings, chairs, etc., to needy patients not accepted at Rutland who are obliged to take out-door treatment at home. The society co-operates with the Associated Charities and the Board of Health, gives medicine, obtains proper clothing, furnishes oil, sputum flasks (through the Board of Health), paper napkins and bags. One patient has been boarded in the country.

HAVERHILL.

The Haverhill Association for the Relief and Control of Tuberculosis; organized in April, 1907. President, I. J. Clarke, M.D.; Secretary, Frank H. Coffin, M.D., 112 Emerson Street.

Haverhill has a flourishing society of about seven hundred and fifty members. The educational work has been carried out by the distribution of anti-tuberculosis literature to all the homes of the city, and is being still further extended to the factories. An exhibit with public lectures was arranged during the past year. A dispensary has been established, and tuberculous patients are cared for under the class system. The relief work is carried on by a visiting nurse, a part of whose time is at the disposal of the Association. The principal work at present is in building balconies for patients to sleep in at night, especially those who continue at their work.

HOLYOKE.

The Holyoke Association for the Prevention and Relief of Tuberculosis; organized in February, 1907. President, C. A. Allen, M.D.; Secretary, Mrs. R. S. Vining, 1235 Dwight Street.

The Holyoke Medical Association held a public meeting early in February, 1907, and in consequence of the interest then aroused the Association was soon afterwards organized.

Five thousand leaflets, printed in three languages, on the cause,

prevention and cure of tuberculosis, were distributed throughout the city and two thousand cards were given to the school children. A series of lectures were delivered by the president in the churches. Later an exhibit was held, lectures being given during the evening. Starting with a class of three patients, the membership soon grew to eighteen. Some were aided to go to Rutland, and relief was given to advanced cases. Much personal instruction was given at the homes of the patients by the visiting nurse. A day-camp has been recently started, and is in a flourishing condition.

LAWRENCE.

The Lawrence Anti-tuberculosis League; organized in November, 1907. President, C. G. Carleton, M.D.; Secretary, Mrs. Helen L. Sherman.

Educational work, aided by an exhibition, has been carried on. At the Lawrence General Hospital a clinic for the examination and treatment of tuberculous patients has been established, as well as a day-camp on the hospital grounds. A number of needy advanced cases have been found and cared for, and food and other necessities supplied in some instances.

LOWELL.

The Lowell Anti-tuberculosis Association. President, Mrs. Frederick T. Greenhalge.

The active work of the Association has been to hold an exhibit and conduct a campaign of education. A visiting nurse is available to visit the sick persons coming under the notice of the Association. Through the generosity of Frederick F. Ayer, the Lowell General Hospital now has a thoroughly equipped tuberculosis department. The physicians of Lowell are especially active in the tuberculosis work, and have an energetic committee. A day-camp at the Lowell General Hospital furnishes accommodations for twenty-eight patients.

DAY CAMP AT HOLYOKE.

LYNN.

The Lynn Association for the Relief and Control of Tuberculosis; organized in March, 1907. President, Rev. Ernest J. Dennen; Secretary, H. W. Newhall, M.D.

The educational campaign was first inaugurated. An exhibition was held and lectures given. Relief work was at once started, and half the time of a visiting nurse secured. A successful class of tuberculous patients has been in operation from the beginning, an examining clinic is maintained, and recently a small day-camp was started. The total expense for the first year was about $400.

MALDEN.

The Tuberculosis Committee of the Associated Charities. Chairman, Godfrey Ryder, M.D.; Secretary, Mrs. Edith Macdonald.

The educational campaign has consisted in public meetings, an exhibition held in 1906 and articles in the local newspapers. Much energy was spent in awakening the Board of Health to the importance of the tuberculosis problem. A great amount of relief work has been done for tuberculous patients and their families. A separate index map has been maintained, so that the location of the known patients can be studied. The committee maintains an examining clinic, held Tuesday morning and Saturday evening.

NEW BEDFORD.

The Portuguese League for the Assistance to Consumptives; organized in October, 1906. President, John C. S. Pitta, M.D.

In addition to relief work and nursing in the home, in which the League has been aided by the Instructive District Nursing Association, a day-camp has been started, where beds have been provided for patients needing absolute rest, but who were not sick enough to demand much actual nursing. The League has had the faith to incur a debt of over $1,500 in connection with this

camp. In the near future it is hoped to extend the usefulness of the camp by increasing the building and having a physician in constant attendance. The expenses of the League in the last year were $2,143.

The New Bedford Anti-Tuberculosis Association. President, J. A. McAllister.

Relief and educational work among the citizens and mill operatives has been carried on.

NORTHAMPTON.

The Northampton Association for the Prevention and Control of Tuberculosis. President, Albert M. Belden, M.D.; Secretary, Mrs. Abbie Huxley.

An exhibition has been held and general educational work done, to arouse an active public sentiment. Special efforts are being made to get persons interested in order to obtain money with which to build a ward at the local hospital, to be devoted to the care of tuberculous patients. A free evening examining clinic is held, and plans are being developed for the systematic care of the patients that are found to be tuberculous. The relief and home instruction is carried on by the district visiting nurse. Board in sanatoria, and proper food, have been furnished in individual cases.

PITTSFIELD.

The Pittsfield Anti-Tuberculosis Society. President, J. F. A. Adams, M.D.; Secretary, Miss Julia W. Redfield.

The association has been but recently organized.

SALEM.

The Tuberculosis Committee of the Associated Charities; organized in May, 1907. Chairman, Mr. G. Arthur Bodwell.

The work of education has been carried on by means of a public

exhibit and lectures, supplemented by the distribution of tuberculosis literature. Relief work has been conducted by employing half of the time of a visiting nurse, who has given instruction in the homes of the patients. Further relief work in furnishing supplies has been done in destitute cases. An examining clinic and a special class for tuberculosis patients is conducted at the Salem Hospital. A day-camp has also been recently started. The office of the committee is open three days each week throughout the day. The expenses have been about $30 each month.

SPRINGFIELD.

The Springfield Association for the Prevention of Tuberculosis; organized in 1907. President, H. C. Emerson, M.D.; Secretary, Mr. Clinton E. Bell.

Although the work was started in this city several years ago, no association was organized until last year. The Association has an examining clinic, and the systematic care of the tuberculous patients in their homes has recently been organized. As yet there is no visiting nurse.

WALPOLE.

The Walpole Association for the Relief and Control of Tuberculosis; organized in 1907. President, Secretary and Treasurer, Eleanor Way-Allen, M.D.

Walpole is a small town, and the work has been largely educational, and has consisted of an exhibit, lectures and the distribution of literature to the voters of the town and to the factory employees. The factories have been placarded with anti-expectoration notices, and provided with cuspidors. Employees who are in suspiciously poor health are examined, and when found to be tuberculous, if necessary assisted to go to Rutland. In the relief work a number of individual cases have been helped. Funds for the work have come largely from a single individual.

WALTHAM.

The Waltham Anti-Tuberculosis Society; organized in June, 1908. President, Mr. George A. Fiel; Secretary, Charles B. Fuller, M.D.

The society will continue the work already done by the District Nursing Association. The Waltham Hospital has agreed to take certain cases of tuberculosis, on request of the Board of Health.

WINCHESTER.

The Winchester Visiting Nursing Association. President, Mrs. Joshua Coit; Secretary, Mrs. E. C. Gilman.

The Association has taken up special tuberculosis work, and is entitled to a place in this list. It maintains a special clinic at the Association rooms, and provides for the systematic treatment of the tuberculosis patients. Relief work is done by two nurses employed by the Association. Board and other forms of aid have been freely given. In co-operation with the Women's Club, literature upon tuberculosis and general hygiene has been distributed. Public sentiment has also been aroused to favor the enforcement of the town ordinances against expectoration on sidewalks and in public buildings.

WOBURN.

The Woburn Medical Association; organized in 1908. President, Robert Chalmers, M.D.; Secretary, M. M. Stevens, M.D.

A day-camp was opened June 15, 1908.

WORCESTER.

The Worcester Tuberculosis Relief Association; organized in January, 1904; incorporated in 1907. President, Albert C. Getchell, M.D.; Treasurer and Clerk, Mr. Earle Brown.

The Tuberculosis Relief Association has co-ordinated all the various charities and activities in the city, so far as possible. It

has distributed leaflets, provided lectures, maintained the tuberculosis exhibit, conducted a propaganda through the press, furnished free sputum boxes and given relief.

This year a nurse has been employed, whose whole time is given to this work. She is in regular attendance at both the tuberculosis clinics, visits all patients who apply there and such other patients as are referred to her either by private physicians or by others. She notifies the Board of Health in case of removal or death, and sees to it that premises are properly disinfected. The District Nursing Society is depended on for the continued nursing of some cases.

The Memorial Hospital and the Worcester City Hospital each maintains a tuberculosis clinic. One of the assistant physicians at the City Hospital clinic directs the outside work of that institution, making as many visits as are necessary in co-operation with the tuberculosis nurse. The Association has not organized classes, because it thinks individual work is more effective, and so far its machinery is adequate for that work. It endeavors to send all suitable patients to the State Sanatorium, furnishing, if need be, the funds direct, or providing them from other charities.

CHAPTER XII.

EXPERIMENTAL RESEARCHES IN TUBERCULOSIS, WITH SPECIAL REFERENCE TO ETIOLOGY, PATHOLOGY AND IMMUNITY.

Theobald Smith, M.D.

Activities which belong to the field of medical science may be grouped into researches concerned with the nature and causation of pathologic phenomena, and those concerned with the application of the knowledge disclosed to the prevention and treatment of disease.

To trace these activities over a definite geographic area, such as a State, is difficult, for research in any subject which concerns the population of the world goes on simultaneously in many places. The stream of research activities is continuous only when we bring into our view the entire civilized world. When we view a small territory, it is more like examining separate brooks having no connection with one another, which, however, eventually contribute to the main stream. These researches emanate largely from laboratories, and are experimental in character. They differ from those of practical medicine only in so far as the conditions under which the special problems of disease are being investigated are either known, or else controlled or carefully balanced by unknown factors of presumably equal value. This use of controls is the more extended, the larger the number of unknown elements which enter into the problem. It is either impossible or possible only through the use of statistics or the accumulation of numbers of cases that the practice of medicine can control its work. Beyond this there is no fundamental distinction, nor even any sharp dividing line between experimental and clinical medicine. One insensibly shades into the other by gradations. The hope of con-

tinued and greater success in the limitation of disease lies in slowly pushing the methods of experimental medicine into clinical work. This has been going on to a very large extent by the development of hospital laboratories. Laboratory activities on a large scale are co-extensive with the modern era of bacteriology, and this in turn has as its chief starting point the discovery of the tubercle bacillus by Koch in 1882.

These activities are grouped in the main around three epochs in the development of our knowledge of tuberculosis, — the discovery of the tubercle bacillus, the introduction of tuberculin as a curative and diagnostic agent, and the differentiation of the races of mammalian tubercle bacilli provisionally into human and bovine. Each event acted as a stimulus, aroused the waning interest in the nature and activities of the tubercle bacillus, and supported the flagging hope for the discovery of some easily applied curative or immunizing agent.

The period preceding the discovery of the tubercle bacillus was devoted chiefly to the macroscopic and microscopic study of the tubercle, and to speculations concerning its origin and nature. Though the infectious properties of tuberculous matter had been demonstrated by Kleucke in 1843 and again by Villemin in 1865, yet the conception of infection from without with reference to this disease did not seem to flourish or to lay hold of medical thinking.[1]

Among the writings emanating from Massachusetts during the period preceding the discovery of the tubercle bacillus perhaps one may be mentioned, as it is based upon macroscopic and microscopic examination of tuberculous and other tissue from sixteen cases. I refer to the Boylston Prize Essay of Calvin Ellis, entitled "Tubercle: Its Pathology and especially its Relation to Inflammation."[2] Ellis described the macroscopic and microscopic char-

[1] R. H. Fitz. The Theory of Tuberculosis. Mass. Medical Society. 1871.
[2] Am. Journ. Med. Sc., 1860, N. S. XXXIX, 339.

acters of "gray and yellow" tubercle, its chemical characters and metamorphoses. He discussed its distribution in the body and the diseases which are incompatible with it. With the aid of quotations from the writings of Virchow, Reinhardt and Spiess, he analyzes the tuberculous process and comes to the following conclusions: —

> It [tubercle] is not a specific exudation.
>
> It does not exist as such in the blood.
>
> The yellow variety is always the result of metamorphosis — of degeneration.
>
> It is altogether probable that it is owing to a "degraded condition of the nutritive material," which differs from that furnished under ordinary circumstances, "not in kind, but in degree of vitality or capacity for organization."

The selection and grouping of publications emanating from Massachusetts since the discovery of the tubercle bacillus has been a task of considerable difficulty. Only those papers have been chosen which presented evidence of laboratory work done, as contrasted with clinical work, to support the statement made and conclusions reached. This rule of choice reduced the available material to a relatively small amount.

As regards the order of presentation, it was found impracticable to deal with the publications chronologically or with reference to the three epochs mentioned above, and it was deemed best to bring together those which are logically related to one another.

The review of each paper has been purposely made short, and the author's conclusions cited wherever possible. Critical comments have been withheld excepting where the results were open to doubt and at the same time of great practical significance. The writer has a vague presentiment that papers have been overlooked which should have been included in this chapter's summary, but he hopes that the neglected authors will be lenient with him for his shortcomings.

ETIOLOGY OF TUBERCULOSIS.

The Morphology and Biology of the Tubercle Bacillus.

The early work on the relation of the tubercle bacillus to tuberculosis, its morphology and cultivation and the methods used for staining it, was designed largely to repeat and confirm the original work of Koch, and to acquaint the medical profession with the laboratory methods used by him and the inferences and conclusions drawn by him from his experiments. This period has little originality to show. The progress made by Koch over his contemporaries in almost everything undertaken by him, his original and advanced points of view and his new methods of research, left all far behind. Koch had so thoroughly covered the field that it required years to discover any untilled corners. Moreover, laboratories were just being created. Apparatus had to be improvised, contrived or newly invented to meet the sudden expansion of bacteriological methods.

Harold C. Ernst[1] describes his experience with the different staining methods then in use and gives formulæ for each. He gives his preference to the Koch method. He also describes the method for procuring pure cultures of the bacillus of tuberculosis, following Koch's directions as closely as possible, and cites a list of the pathological material submitted to microscopic examination. Guinea-pigs were also inoculated. The entire work is in a sense a repetition and confirmation of a portion of Koch's original investigation.

E. W. Cushing[2] gives an exhaustive summary of Koch's original monograph on the bacillus of tuberculosis. In a second paper[3] an account of the methods of staining the bacilli and the manipulation of the microscope for their detection is given.

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[1] Amer. Journ. Med. Sciences. 1884. LXXXVIII, 367.
[2] Bost. Med. & Surg. Journ. 1885. CXIII, 533.
[3] Ibid. 1886. CXIV, 277.

A similar paper was published by W. F. Whitney.[1]

The pathology of cutaneous tuberculosis was discussed by John T. Bowen[2] with special reference to miliary tuberculosis of the skin, scrofuloderma, lupus and tuberculosis verrucosa cutis. The pathological anatomy of these lesions is carefully described with reference to the primary seat of the lesion, the formation of the specific tuberculous tissue, the degenerations and regenerations associated with it.

A similar paper was published by C. J. White[3] in 1905. Dr. White's treatment of the subject approaches the clinical, and is descriptive of the various well determined and debated forms of skin tuberculosis. Inasmuch as the descriptions are limited to the naked-eye appearances, the paper belongs more properly among the clinical contributions.

The resistance of tubercle bacilli to destruction by drying has been of great interest to sanitarians, in view of the current theory that pulmonary tuberculosis is largely an inhalation disease.

In 1890 Dr. A. K. Stone[4] tested on rabbits three lots of sputum in which tubercle bacilli had been demonstrated about three years before. The sputum remained on "the laboratory shelves quiet and undisturbed" during this long period. When it was used upon rabbits, the sputum was represented either by a little dry dust or else by a hard brown crust covering the bottom of the jar. The notes on the inoculated rabbits suggest local tuberculosis of limited extent. The proof that tubercle bacilli may survive so long under the conditions mentioned should have been strengthened by either cultures or subinoculations from the original rabbits, since the results are at variance with those of other investigators.

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[1] "The Etiology of Tuberculosis." Riverside Press, Cambridge, 1882.
[2] Bost. Med. & Surg. Journ. 1891. CXXV, 516.
[3] Bost. Med. & Surg. Journ. 1905. CLIII, 291.
[4] Amer. Journ. Med. Sc. 1891. CI, 275.

The thermal deathpoint of tubercle bacilli was investigated by the writer[1] primarily to determine any possible differences in this respect between the human and bovine types. No differences were discovered, but earlier observations were rectified by demonstrating that the tubercle bacillus is killed in fluids by twenty minutes' exposure at 60° C., and that former discrepancies are accounted for by the fact that in milk a pellicle forms which protects the bacilli from the heat. By heating milk in closed vessels this difficulty is eliminated.

TUBERCULIN.

Infection and Immunity.

The second era or epoch in the investigation of tuberculosis was ushered in with the announcement in 1890 that a cure for tuberculosis had been discovered by Koch. Again a number of publications appeared, but they were chiefly the results of observations made on patients to test the statement of Koch that tuberculin was curative. Slowly the tide turned against this new substance, for good and obvious reasons, for Koch had simply discovered what would now be called an instance of anaphylaxis or the sensitization of the human being, by virtue of infection, to certain extracts of the tubercle bacillus. The immense impetus given to research by this and the nearly contemporaneous discovery of antitoxin by von Behring brought into the foreground for investigation the problem of immunity, of which the tuberculin reaction was but a fragment. This great problem, long nurtured by the genius of Pasteur, slumbered elsewhere until awakened by these great discoveries. Even after seventeen years, immunity still presents subsidiary problems of the greatest importance to the science of biology and to the practice of medicine.

Belonging to this period there is one paper which should be

[1] Journ. Exper. Med. 1899. IV, 217.

mentioned here. J. A. Jeffries[1] made extracts of tubercle bacilli with alcohol, ether, chloroform and benzol, as well as glycerine. Tuberculous guinea-pigs were made very sick with the latter. The series of experiments was interrupted by an accident. This paper was in line with Koch's work, but unfortunately was not completed.

Among the papers belonging to this chapter, but published at a much later date, the following embody considerable laboratory work. A painstaking investigation on the effect of tuberculins made from human and bovine tubercle bacilli was published by S. B. Wolbach and Harold C. Ernst[2] in 1904. Cultures were freshly isolated directly from the respective hosts, and tuberculin made in the usual way. The relative virulence of the human and the bovine culture was first determined in rabbits and guinea-pigs. The tuberculins were next tested on tuberculous guinea-pigs, and it was found that both acted alike upon guinea-pigs infected with human or bovine bacilli. Finally, inoculated guinea-pigs were treated with small doses of tuberculin. Eighteen were inoculated with human and an equal number with bovine bacilli. One-half of each set was treated with human, the other half with bovine tuberculin. The results were more or less conflicting, but it was noticed that many treated guinea-pigs gained in weight and in some the local ulcer healed. The contents of the local inoculation abscess also discharged more rapidly and completely in the treated than in the control animals. The inference was that the tuberculin treatment on the whole acts favorably upon tuberculous guinea-pigs.

In a paper presented before the Harvey Society of New York, the writer[3] goes into the subject of infection and immunity in tuberculosis. He discusses the portals of entry, and points out the fact observed by him in a large number of autopsies in 1893, that in cattle the primary foci of infection are the regional lymph

[1] Bost. Med. & Surg. Journ. 1891. CXXVI, 185.
[2] Journ. Med. Research. XII, 295.
[3] Journ. Amer. Med. Assoc. 1906. XLVI, 1247 and 1345.

nodes of the throat, the lungs and the small intestines, and only very rarely the organs or mucous membranes through which the bacilli must pass to the lymph nodes. The action of dead tubercle bacilli and of tuberculin is discussed on the basis of a large series of experiments on guinea-pigs by him, and the earlier experiments of Straus, Prudden and others. Lastly, the problem of vaccination with tubercle bacilli killed at 60° C. is taken up and recommended as a means of suppressing the disease.

In recent years the suppression of bovine tuberculosis by means of vaccination has been strongly advocated by von Behring, and a method developed by him on a commercial scale which has been applied in many countries. The desire to obtain first-hand information concerning the efficacy of this method led the Massachusetts Society for Promoting Agriculture to grant the writer a certain sum of money to carry on a series of vaccination tests on calves.[1]

The outcome of these investigations demonstrated, as had been done by Koch and co-workers in Germany, that almost any human type of tubercle bacillus could be used in place of the bovovaccine, and that the vaccine could be easily and cheaply prepared by those who were acquainted with the chief characters of the human tubercle bacillus. It was also clearly shown that the immunity due to two injections of suspensions of human bacilli is not quite high enough, and the writer suggests for valuable animals a third injection of attenuated bovine bacilli.

PUBLIC-HEALTH ASPECTS OF TUBERCULOSIS.

Transmission from Man to Man and from Animals to Man.

The presence of tubercle bacilli in the milk of tuberculous cows with apparently normal udders was investigated by Harold C. Ernst,[2] assisted by Drs. Austin Peters, Henry Jackson and L.

[1] Journ. Med. Research. 1908, XVIII, 451.

[2] Amer. Journ. Med. Sciences. 1889, XCVIII, 439. Infectiousness of Milk. 1894. 141. 17 plates.

Frothingham. Tubercle bacilli were seen in coverslip preparations of the milk of twelve out of thirty-six cows. By inoculation of guinea-pigs, tubercle bacilli were detected in the milk of six out of fifteen cows. By the inoculation of rabbits, the milk of four out of nineteen cows was found infected with tubercle bacilli. Feeding experiments were also instituted on a large scale with calves, pigs and rabbits, with results corroborating those obtained by inoculation.

At the same time samples of milk and cream from the supply of the city of Boston were subjected to microscopic examination and inoculation. The results were as follows: in thirty-three samples, tubercle bacilli were detected with the microscope once, and three times in inoculated rabbits. The rest of the volume contains letters from practitioners bearing upon clinical observations of tuberculosis traceable to the milk supply. As this portion is of clinical rather than scientific value, it does not come within the scope of this chapter. The conclusions reached by the author are as follows: —

1. While the transmission of tuberculosis by milk is probably not the most important means by which the disease is propagated, it is something to be guarded against most carefully.

2. The possibility of milk from tuberculous udders containing the infectious element is undeniable.

3. With the evidence here presented, it is equally undeniable that milk from diseased cows with no appreciable lesion of the udder may, and not infrequently does, contain the bacillus of the disease.

4. Therefore, all such milk should be condemned as food.

Dr. F. T. Lord contributes an important article on flies and tuberculosis.[1] As the result of laboratory experiments with flies, in which feeding of sputum was practised and the fly-specks studied, the following conclusions were reached: —

1. Flies may ingest tubercular sputum and excrete tubercle bacilli, the virulence of which may last at least fifteen days.

[1] Bost. Med. & Surg. Journ. 1904, CLI, 651.

2. The danger of human infection from tubercular fly-specks is by the ingestion of the specks on food. Spontaneous liberation of tubercle bacilli from fly-specks is unlikely. If mechanically disturbed, infection of the surrounding air may occur.

As a corollary to these conclusions, it is suggested that: —

3. Tubercular material (sputum, pus from discharging sinuses, fecal matter from patients with intestinal tuberculosis, etc.) should be carefully protected from flies, lest they act as disseminators of the tubercle bacilli.

4. During the fly season, greater attention should be paid to the screening of rooms and hospital wards containing patients with tuberculosis, and laboratories where tubercular material is examined.

5. As these precautions would not eliminate fly infection by patients at large, food stuffs should be protected from flies who may already have ingested tubercular material.

THE INTERRELATION OF HUMAN AND ANIMAL TUBERCULOSIS.

Variation among Tubercle Bacilli.

The identity of tubercle bacilli isolated from cattle and man had been regarded as definitely established by the great work of Koch published in 1884. Ten years later, sanitary measures based upon this assumed identity and the discovery of tuberculin as a diagnostic agent were in force in all civilized countries. In some the zeal to wipe out bovine tuberculosis obscured for a time the more important issue of the transmission of tuberculosis from man to man, when it became known through the use of tuberculin to what extent cattle were infected with tuberculosis. The discovery of Maffucci, that the tubercle bacillus of birds was a distinct race or variety, had been accepted by Koch himself.

That bovine and human bacilli are not identical had occurred to the writer in studying the inoculation disease in guinea-pigs. In 1894–95 two cultures, one from cattle, and one presumably, though indirectly, of human origin, were studied in Washington, D. C., and tested in cattle, and such great differences discovered that further studies were at once begun. This first communication

was not published until 1896, but the subject began to arouse some interest and considerable opposition. L. Frothingham[1] investigated the subject for the Massachusetts Cattle Commission, and published his results in 1897.

A culture of human bacilli was used, isolated from the liver of a child, and about one year old. Two calves, three months and three weeks old respectively, received suspensions of the culture into the peritoneal cavity. In both only slight local nodules were produced, some resembling spontaneous tubercle, others tending towards granulation tissue. Two calves, three weeks and two months old respectively, were inoculated into the trachea. In one case the large local abscess in the muscles of the neck indicated a deposit there of much of the material destined for the lungs. In the liver and lungs a small number of minute tubercles, practically devoid of tubercle bacilli, were found. In the other calf lesions were absent. Thus, in spite of the immature age of these animals, the tubercle bacillus may be said to have had but a trifling local effect on them. The tests on guinea-pigs indicate a very attenuated culture.

In a second experiment human sputum containing many bacilli was inoculated under the skin of one calf and into the trachea of two others. The animals were killed four to five months after inoculation. The subcutaneous inoculation was apparently negative. In the others the lungs were normal, the muscular tissue around the trachea was slightly involved, but there was no active, progressive disease from this focus.

From present knowledge of the effects of bovine tubercle bacilli on young calves, we may say that neither the pure culture nor the sputum inoculated by Frothingham contained bovine bacilli.

In 1898 the writer[2] published the second paper on the com-

[1] Ann. Rept. Bd. of Cattle Commissioners of the Commonwealth of Mass. Jan. 1897. 49. Translated in Ztschr. f. Thiermedizin, 1897. 1, 330.

[2] Jour. Exper. Med. 1898. III, 451.

parative study of human and animal tubercle bacilli. This investigation included seven cultures from man, five from cattle, and one each from a pig, a cat and a horse. It consisted of a study of the morphological and cultural characters of the bacilli, of their pathogenic action on guinea-pigs, rabbits, mice, pigeons and cattle, and of the histological character of the lesions produced. Throughout an effort was made to have the study of cultures from human and bovine sources run parallel. Only in this way could any satisfactory basis for comparison be established.

Inasmuch as in this paper the writer has formulated nearly all the problems which have since then occupied the attention of investigators in many countries, its contents are best reviewed by a few direct quotations: —

The foregoing experiments, while they show unmistakably the close relationship existing among the various cultures studied, nevertheless justify us, if only to guide and stimulate further study, in establishing a distinctively human or sputum and a bovine variety of the tubercle bacillus. It might be better to omit the host designation of such varieties, in order to anticipate assumptions that they are necessarily limited to the host whose name they bear. Still, the convenience of using the host's name is so great that I shall succumb to it. The characters upon which the bovine variety may be based reside, morphologically, in the invariably short, straight form and in the greater resistance of this form to modifying influences of culture-media; biologically, in a greater resistance to artificial cultivation and in a much greater pathogenic activity towards rabbits, guinea-pigs and cattle.

There is proof, furthermore, of the existence of slightly varying characters even within the varieties proposed. Among the bovine forms studied, slight variations in virulence were noticeable. Among the sputum forms, variations in size, in capacity for cultivation, and in pathogenic activity have been observed.

Putting all the facts obtained by experiments upon cattle together, it would seem as though the sputum bacillus cannot gain lodgment in cattle through the ordinary channels. These avenues, well provided with protective mechanisms, receive the bacilli probably one at a time. However closely the sputum and the bovine bacillus may be related, it seems as if under ordinary circumstances the former would fall an easy prey to destruction. This inference will gain in weight if we bear in mind that the far more potent bovine bacillus produces in at least 50 per cent. of the spontaneously infected cattle a purely local disease, which

probably would remain so if the animal were surrounded with favorable conditions.

The second and most important proposition, the transmission of bovine bacilli to the human subject, has been much discussed in recent years, without, however, bringing us any nearer to definite knowledge.

If bovine bacilli may invade the human body without let or hindrance, we have not only food infection through milk and milk products to guard against, but also the inhalation disease to which men are exposed in stables containing tuberculous cattle. What proportion of tuberculous subjects may derive their infection from these sources we do not know. Now that we have established some fairly pronounced differences between bovine and sputum bacilli, the whole discussion might be cut short by the suggestion that the time has come to stop citing old and doubtful cases, and to go to work to study with care the tubercle bacilli from cases of supposed animal origin, so that some experimental, trustworthy basis may be formed upon which to found statistics.

While this is in truth what will have to be done, and is the goal which has been aimed at from the outset in this tedious work, it will take much time and persistent attention to collect evidence of this kind. In the mean time, the relation of bovine to human tuberculosis must be somehow defined before a fairly helpless and frightened public. It seems to me that, accepting the clinical evidence on hand, bovine tuberculosis may be transmitted to children when the body is overpowered by large numbers of bacilli, as in udder tuberculosis, or when certain unknown favorable conditions exist. To prevent this from occurring, a rigid periodic dairy inspection and the removal of all suspicious udder affections and all emaciated animals is as much as public health authorities can at present demand. Any measures beyond these belong to agriculture, with which the public health has no business to meddle, without endangering the chances of gaining authority to enforce its own necessary measures. If the evidence gained by pathology in the future should reveal a greater danger than is here assumed, the scientific basis of such evidence will, I think, force all additional measures needed.

But for the student of etiology the problem does not end in the differentiation of varieties. It reaches out much farther than this, and involves some puzzling questions. The most important one bears on the possible changes which the tubercle bacillus may undergo during its prolonged sojourn in the human body. I have already referred to one phase of this question in mentioning the saprophytic growth of the sputum bacillus in the affected lungs and necrotic tissue, as contrasted with its slight multiplication in living tissue and with the generally slight multiplication of the bovine bacillus in the tissue of cattle. This question is a very complicated one, and nothing is easier than to reason in a circle about it, because of the entire absence of data. The first hypothesis to be considered is that which assumes the conversion of the bovine bacillus into the sputum bacillus in the human body. . . .

The question of phthisis as secondary to infection by way of the digestive organs is, however, one needing more attention, for experimental results in this direction are quite suggestive. In all mammals the lungs are evidently the most favored place of tubercle bacilli, and wherever the latter may be deposited, they sooner or later, unless the disease is checked, reach that organ, where the process spreads more rapidly than elsewhere. This march from the place of infection is not infrequently partially concealed by reparative processes. . . .

With the two facts before us that tubercle bacilli gravitate, as it were, towards the lungs in all the susceptible mammals, and that they may conceal their movements in the body quite effectually, we must regard infection through the digestive tract as a source of phthisis at least deserving more attention. The only question to interest us here is the relation of the bovine bacillus to this process. . . .

Only much painstaking work will enable us to learn whether the human body can produce such a great modification of the bovine bacillus or not.

If in this brief summary I have presented nothing but problems to be solved and doubts to be entertained, I feel quite confident that the comparative study of tubercle bacilli will lead to some definite understanding on certain important questions, and eventually to more light on the whole subject of tuberculosis, from the preventive as well as the therapeutic side.

The main questions proposing themselves to the investigator are:—

1. The study of tubercle bacilli from different types of tuberculosis, to determine their relation to the sputum bacillus and the bovine bacillus as regards virulence.

2. The study of the bacilli in primary intestinal disease and in all tubercular disease in children in which the source of infection is assumed to be outside of the family and possibly in the milk.

The work of studying tubercle bacilli from different sources was continued as opportunity presented itself until 1907. It was then taken up in the writer's laboratory by Dr. P. A. Lewis, who has succeeded in isolating and studying from all points of view cultures from fifteen cases of tuberculous cervical and mesenteric lymph nodes in children. As this work will probably appear before the close of the present year (1908), further comment is unnecessary. In the papers of the writer [1] which have thus far appeared,

[1] Notes on a tubercle bacillus having a low degree of virulence. Journ. Bost. Soc. Med. Sciences. Nov., 1898. Studies in mammalian tubercle bacilli. III. Trans. Assoc. Amer. Physicians, 1903, and Journ. Med. Research, 1905. XIII, 253. A study of tubercle bacilli isolated from three cases of tuberculosis of the mesenteric lymph nodes. Amer. Journ. Med. Sc. 1904, Aug. Studies in mammalian tubercle bacilli. IV. Journ. Med. Research. 1907. XVI, 435 (with Mr. Herbert R. Brown). The reaction curve of tubercle bacilli from different sources in bouillon containing different amounts of glycerin. Journ. Med. Research. 1905. XIII, 405.

there have been studied, in all, twenty-four human, nine bovine, three cat, one dog, two swine, one horse and one Coati culture. Among the twenty-four cultures from man, five were regarded as of bovine origin. Two of these were from mesenteric lymph nodes, three from tonsils and cervical lymph nodes.

In one of the papers a reaction is described which enables us to divide all tubercle bacilli into two classes: first, those which produce a final alkaline or neutral reaction to phenolphthalein in glycerin bouillon; and second, those which produce a final acid reaction. Bovine cultures thus far examined have belonged to the first group, most human cultures to the second. Those human cultures which belonged to the first group possessed also other characteristics of the bovine type, and the infection of the cases was assumed to be from the milk.

The existence of varieties of the human tubercle bacillus as well as of the bovine bacillus was observed by the writer and by all investigators who studied carefully series of cultures. This subject of variation among tubercle bacilli is reviewed by the writer [1] in a general way in a short paper in 1899.

The relation existing between bovine and human tuberculosis is one of great importance to the public health, because of the excessive use of cows' milk in infancy and in various states of disease and invalidism. The writer [2] summarized the relationship as deducible from reports of investigations in 1902 and 1907.

In these papers he takes a middle ground, — that there is danger from cows' milk containing tubercle bacilli, but that the danger has been overestimated. Under the existing conditions he advises thorough sanitary inspection of dairy herds and the eliminating of all cows showing wasting and any doubtful udder affection. In the second paper arguments drawn from comparative pathology

[1] Bost. Med. & Surg. Journ. 1899. Jan. 12.
[2] The Medical News. 1902. LXXX, 343. The Bost. Med. & Surg. Journ. 1907. CLVII, 240.

and bacteriology are presented to combat the theory of the modification of the bovine into the human type of tubercle bacillus in the human body, and also the tendency to regard pulmonary tuberculosis as started chiefly by bacilli absorbed from the digestive tract. He urges the need of more investigation to clear up definitely the controverted points.

Studies on the morphology of the tubercle bacillus from human and bovine sources were published by S. B. Wolbach and Harold C. Ernst.[1] By planting cultures on a variety of media, and examining at different intervals of time, they came to the following summary: —

1. The tubercle bacillus undergoes marked changes in morphology with change of culture medium.

2. The microscopic characteristics of a fully developed culture are fairly constant for each medium.

3. Growth for several generations on a given medium has not tended to impart fixed characteristics, the change in form being just as prompt and complete as when transferred after a single generation.

4. These changes cannot be explained by assuming that the sole difference is in the favorability of the medium for the growth of the tubercle bacillus. Both Dorset's egg medium and the brain medium must be classed as extremely favorable ones; growth on each appears at about the same time and progresses about equally rapidly. The reaction of the medium also does not explain these changes, as the different media may have precisely the same reaction and yet these changes occur.

5. The greatest variations in form and staining reaction are found in rapidly growing cultures, and we agree with Coppen-Jones in regard to the conditions best suited for the production of branched and filiform forms, namely, a favorable medium and free access to oxygen.

6. The only interpretation of the great diversity of form assumed by the tubercle bacillus when grown under the most favorable conditions is that it is truly pleomorphic, and should be classed among the higher bacteria.

A similar investigation was made by the writer[2] chiefly for the purpose of finding additional methods for distinguishing the human

[1] Journ. Med. Research. 1903. X, 313. 13 plates.

[2] Trans. Nat'l Assoc. for the Study and Prevention of Tuberculosis. 1905. I, 211.

from the bovine type of bacilli. The impulse to the study was given by the change in the form of bovine tubercle bacilli observed in impure cultures. As soon as the culture was purified the bacilli assumed their original short form. The probable explanation of the phenomenon observed is the softening and increased stickiness of the outer layer or capsule of the bacilli in the impure culture, perhaps under the influence of some bacterial enzyme.

CHAPTER XIII.

OUT-OF-DOOR SLEEPING IN NEW ENGLAND.

Charles S. Millet, M.D.

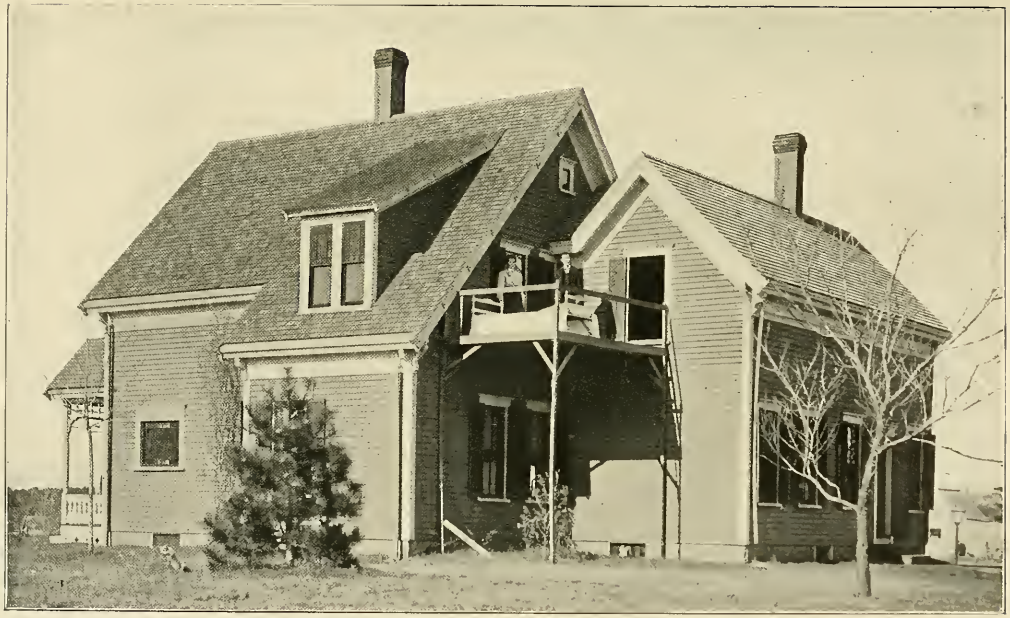
The New England climate has for a long time had a national reputation for insalubrity. Its variability and bleak east winds have been the subject of much comment, both by natives and visitors, and yet one of the most important steps taken in the campaign against tuberculosis since the discovery of the tubercle bacillus, namely, out-of-door sleeping, had its origin in Massachusetts, where formerly a large proportion of the population had always been afraid of out-of-door air, and especially at night, and have attributed their coughs and colds to the weather rather than to the true cause.

In the winter of 1898 the writer was called to see a young married man with an unusual family history of tuberculosis. His father, brother, grandfather, two aunts and an uncle all had died of consumption. He had been coughing and losing flesh for several weeks, and at the time of presenting himself for examination he suffered from coughing, wheezing and shortness of breath and nearly every day had a temperature of 100.5°. There was no marked physical evidence of pulmonary infection, but throughout the winter, in spite of the use of remedies ordinarily employed in such cases he continued to lose ground. By spring time he had lost nearly fifteen pounds, and had become so weak that he could exert himself but little without marked dyspnœa.

On May 2, two leading specialists saw him in consultation, and agreed that he undoubtedly had pulmonary tuberculosis, and they recommended that he be sent to Arizona; one advising that the

change be made immediately, and the other suggesting that first he might try the effect of rest for a period of two months, at the end of which time, if he did not show decided improvement, the change should be made. He was much depressed at the thought of leaving home, and very shortly lost four or five pounds more. A short time afterwards a paper on the foreign sanatoria for the treatment of tuberculosis was given in Boston, with stereopticon views, and the writer was much impressed by the difference in the manner of treatment of disease in this country and in Germany; and that which made the deepest impression was the statement that Detweiller, of Görbersdorf, kept his patients up late at night, in order to increase the number of hours spent in the open air. This suggested the thought that, inasmuch as consumptives need their night's rest fully as much as pure air, it might be of advantage to sleep out of doors; and on the following day the patient was asked if he would make the experiment, and was assured that if he agreed, nothing more would be said about being sent away from home. He accepted the plan, and proceeded to erect a platform on the south side of his house. He began sleeping there in the latter part of June, 1898, and during the next five months passed every night there, with the exception of nine, when he was prevented from doing so by rain. Within the first two weeks improvement was evident, and at the end of a month his temperature was normal at all times of the day, his coughing and wheezing had nearly disappeared and he seemed to be on the road to recovery. At Thanksgiving time his weight was one hundred and forty-four pounds, — a gain of twenty-two pounds in five months; and at the present time he weighs one hundred and forty-seven. He has been perfectly free from pulmonary symptoms during all this time.

During the months of his experiment he worked nine hours a day four days in the week in a shoe factory, situated in the same town, which is twelve miles from the seacoast and but one hundred



ORIGINAL SLEEPING BALCONY IN HANOVER. Used since June, 1898.

feet above sea level. He wore at night a soft felt hat and cotton night shirt, and was covered with the ordinary bed clothes. He went to bed usually before nine o'clock, because the sun awakened him very early in the morning.

The result of the experience with this patient led to the conclusion that this must be the proper way to treat, not only tuberculosis, but all pulmonary diseases, since if an abundance of fresh air is good for chronic pulmonary complaints, it ought to be quite as beneficial in acute complaints as well. In consequence, during the next winter every case of pneumonia which came under the writer's care was treated in a room with wide-open windows, regardless of the age of the patient. Even a child eighteen months old was placed close to an open window in March when the wind was blowing a gale. During the summer of 1899, seven additional patients were induced to sleep out-of-doors.

It has been well said that the importance of out-door sleeping in the treatment of tuberculosis can scarcely be overestimated, and it has been the writer's experience that one can obtain far more rest out of doors in six hours than indoors in eight. The following are the closing words of a paper read by the writer nine years ago, and they are reproduced here because they are still believed to be true, although neither the profession nor the public has as yet fully accepted them: —

> One word about those cabalistic terms "dampness" and "draughts." They are bugbears, that is all, and need not be considered for a moment. Many times these patients have found their bed coverings and night clothes wet with dew, and once in a while a summer's rain has disturbed their healthful slumbers, but with no harm, beyond the necessity of drying the bed-clothes before they are again used.
>
> I am quite ready to believe that, if people could be taught to fear impure air and overheated rooms as they now dread a slight increase of moisture or a little air stirring, tuberculosis would become nearly as infrequent as small-pox.

In the spring of 1900, a small sanatorium was opened at East Bridgewater, in order to emphasize still further the importance

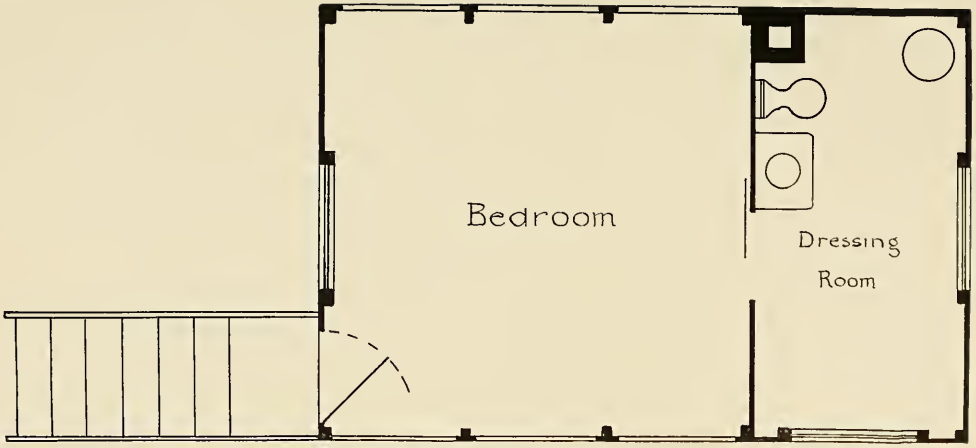
of method over climate in the treatment of consumption, and here was first built the shack which is now so frequently brought into play in fighting this disease. Their use is now so common, both in sanatoria and when applying the treatment at home, that a description of what is considered ideal in this respect may be of interest. By indefinitely multiplying the units, of which the shack-room herein described is one, a large shack or ward can be constructed so as to give a maximum amount of sun and air at a minimum cost.

THE SHACK.

Theoretically, the shack, properly designed, is the ideal construction for housing tuberculous patients. In it the sufferer is constantly surrounded by the purest air, without a chance of contamination or stagnation, and he and everything about him is exposed all day and every day to the curative and vivifying influences of the sunshine. In a large institution the extra cost of attendance upon patients in separate shacks may be a serious item, but even in such establishments some shacks are needed for patients whose symptoms require the conditions which can be provided only in them. For those persons who, under proper advice, undertake their own cure, they are infinitely preferable to the tents commonly used.

The shack for tuberculous patients must have all the air and sun which can possibly be admitted to it, and proper shelter from rain, snow and violent winds must be provided. For this purpose it should face the south; the front should be as open as possible, and much higher than the back, so that the sun's rays may reach all parts of the interior. There should be openings on all the other sides, to give cross-currents of air, although all the openings except those towards the south should have provision for closing them in cold or stormy weather. Even the south openings should

THE MILLET SANATORIUM AT EAST BRIDGEWATER. -- Shack used for Treatment of Tuberculosis.



THE MILLET SANATORIUM.—Floor Plan of Shack.

have screens of some sort, for protection against southerly rains, but they need not often be brought into use. If the shack is near a dwelling-house or administration building which the patient can easily reach, nothing more than a simple structure, twelve feet square, with four walls, a floor and roof, standing on posts, and costing about $100 complete, will be required; but for greater comfort, especially for patients unable to walk far, a dressing room, which will double the cost, may be added, as shown in the accompanying plan and photograph of one of the latest shacks attached to the Millet Sanatorium at East Bridgewater. This building is twelve by eighteen feet, supported on cedar posts, boarded, and the sides and roof shingled. It faces due south, and the roof rises toward the front at an angle of twenty-six and one-half degrees, known to builders as a "quarter pitch." The interior is divided into a bedroom twelve feet square and a dressing room six by twelve feet. The front of the bedroom is entirely open. Sashes can be fitted into the spaces between the posts if necessary, but experience shows that they are not required, light screens, covered with paraffined cloth, having been found sufficient to exclude rain and snow. These screens are hinged to the top of the openings, and are drawn up to the under side of the roof when not in use. The north wall of the bedroom is about six and one-half feet high, and has three openings, which can be closed in bad weather by means of hinged wooden shutters. Toward the west is a door to the outside and a window, and on the east is the sliding door leading into the dressing room, which has a window opposite the door and also a south window. In the dressing room is a chimney and a stove, a set wash-basin with running water, and a water-closet, together with movable bureau and wardrobe. In pleasant weather the windows and door of the dressing room are kept open; in cold weather they are closed, so that the water pipes may not freeze. The bedroom openings are practically never

closed. With the exception of the chimney, the whole construction is of wood. There is no plastering, the partitions being of wood sheathing. The floor is double, the upper floor being a narrow rift North Carolina pine. The cost of this structure, which is one of two exactly alike, was $300. To one who has not been long familiar with the treatment of tuberculosis in shacks of this kind, the comfort and pleasure which the patients find in them is incredible. Even with the thermometer at zero, or below, they do not wish to close the openings; and it is found that they gain more rapidly in the winter than during the milder seasons of the year.

CHAPTER XIV.

ON AN APPARENT CONNECTION BETWEEN POLLUTED PUBLIC WATER SUPPLIES AND THE MORTALITY FROM PULMONARY TUBERCULOSIS.

William T. Sedgwick, Ph.D., and Scott MacNutt, S.B.

In the course of a statistical investigation recently made by us of Hazen's theorem, that for every death from typhoid fever avoided by the purification of polluted water supplies two or three deaths are avoided from other causes,[1] we have been led to the conclusion that among these "other causes" pulmonary tuberculosis holds an important place. We are well aware that tuberculosis is not generally regarded as water-borne, and we have ourselves been surprised to find any evidence of an apparently positive connection of some sort between mortality from pulmonary tuberculosis and polluted public water supplies. Our inquiries obliged us to study with care the vital statistics of the cities of Lawrence and Lowell, Mass., immediately before and after each of these began to supply its citizens with water very much purer than that previously furnished, and also to compare the statistics of each with those of the other, and of both with those of a third city, Manchester, N. H., of the same general character and similarly situated, but supplied during the same periods with a pure upland water drawn from a large lake. In order to show the basis of our comparisons and conclusions, it will be necessary to explain in some detail the way in which these developed during our studies.

It was observed some years ago, first, apparently, by Mr. Hiram F. Mills, the eminent engineer and member of the State Board of

[1] Science. August 7, 1908.

Health of Massachusetts, and by Dr. J. J. Reincke of Hamburg, Germany, that after the purification of a polluted public water supply a decline occurs in the general, or total, death-rate of the community using the water, considerably greater than can be accounted for by the saving in typhoid fever mortality alone. This fact has been quantitatively expressed by Mr. Allen Hazen, the well-known sanitary engineer, in the theorem to which we have connected his name, as stated above. No one, however, as far as we know, has hitherto minutely analyzed the decline referred to, or undertaken to discover by careful statistical studies exactly in what "other causes" of death the saving consists. This task we therefore set before ourselves, and a preliminary communication giving our principal results has already appeared in "Science" for July 31, 1908. It will suffice for our present purposes to state that we found the most marked improvement so far as other causes of death were concerned to reside in pneumonia, pulmonary tuberculosis and infant mortality, and that we were forced to conclude that some connection certainly exists between polluted drinking water and each and all of these.

Lowell and Lawrence are among the most prominent of the manufacturing cities of Massachusetts. They are situated in the valley of the Merrimack River, only nine miles apart. Until 1893, both were supplied with drinking water drawn directly and without any attempt at purification from the river at their doors. In the autumn of that year Lawrence began to use a municipal (slow sand) filter, the first of its kind in America, which was designed by Mr. Mills, then a resident of that city. In 1896, Lowell changed from its polluted water supply to a pure ground-water supply derived from driven wells located not far from the Merrimack River. In both cases the improvement in typhoid fever mortality was immediate and conspicuous. And in both, as Mr. Mills discovered, and as is now easy to observe, there occurred a decline

in the general death-rate — the total mortality — much greater than could be accounted for by the decline in typhoid fever mortality alone. The time, however, was one of general sanitary awakening and of widespread sanitary improvements. A similar fall in the total death-rate was detected at Hamburg, Germany, after the installation of sand filtration of the public water supply of the city subsequent to the great Asiatic cholera epidemic of 1892, and was commented upon by the able health officer of Hamburg, Dr. J. J. Reincke, who was cautiously inclined to attribute it chiefly, if not wholly, to the important and extensive sanitary improvements then everywhere common in Germany and in Hamburg especially, because of the recent epidemic.

In our complete paper, soon to be published, we have reviewed the evidence of various kinds hitherto available, and have there made for ourselves an independent statistical study of all the data bearing upon the various causes of death in Lowell and Lawrence for the five years just before and the five years just after the introduction of pure water into these cities, and for corresponding periods at Manchester, N. H. Manchester was selected as a norm, and in preference to any city or cities of Massachusetts, for the reason that it is not only situated in the same (Merrimack River) valley only a few miles above Lowell and Lawrence, but also because, like them, it has a large population of foreign types, chiefly French Canadian, engaged for the most part in the same (textile) industries. These populations we examined statistically at the outset, and found agreeing to a remarkable extent in respect to age, sex and nationality distribution, and in industrial occupation. We also determined at the outset that these conditions of agreement had remained practically constant throughout the periods under consideration, so that these sources of error were excluded as possible factors of diminished death rates. We were agreeably surprised to find in the three cities studied a set of conditions of

an almost "laboratory" character, making of Manchester a norm, or control, as favorable for our purposes as could have been desired.

Among the causes of death considered in detail was pulmonary tuberculosis. For purposes of comparison, the total deaths from this cause were compared year by year with the estimated population, and the mean death-rates computed for the five-year periods just before, and the five-year periods just after, water supply improvement in Lowell and Lawrence, respectively, the years of actual change being omitted. For Lowell these five-year periods are 1889–93, before, and 1896–1900, after, the improvements having been introduced during 1894 and 1895. For Lawrence, they are 1888–92, before, and 1894–98, after, improvements effective in 1893. In all these cases corresponding periods for comparison have been taken for Manchester, N. H., in which, as already stated, no material change has occurred for many years in the character of the (pure) public water supply. The broad results of these comparisons may be grouped together as follows: —

PULMONARY TUBERCULOSIS.

Annual Death-rates per 100,000 *Population.*

[Five-year periods.]

NAME OF CITY.	Before Water Supply Improvement.	After Water Supply Improvement.
For same periods: —		
Lowell, Mass., ...	288	205
Manchester, N. H., ...	205	200
For same periods: —		
Lawrence, Mass., ...	244	185
Manchester, N. H., ...	222	192

Lowell thus showed a decreased average annual death-rate from pulmonary tuberculosis for the five years following the introduction of pure water of eighty-three per 100,000 inhabitants, while

Manchester showed a decrease of only five per 100,000 inhabitants for the same period. Lawrence showed a decrease of fifty-nine per 100,000 inhabitants annually for the five years after improvement, while for the corresponding years phthisis in Manchester fell off only thirty per 100,000 inhabitants annually. If, as we believe, Manchester's decline may be considered normal for both periods, we are compelled to conclude that the decline in Lowell over and above what might have been expected was about seventy-eight per 100,000 inhabitants yearly, and in Lawrence about twenty-nine per 100,000 inhabitants. Unquestionably, the pulmonary tuberculosis mortality in both Lowell and Lawrence was slowly declining — as in Massachusetts generally — during the periods under consideration. But it appears to have fallen suddenly, and much more than would have been anticipated, and much more than it actually did fall in a nearby city of closely similar character during the years immediately following a great change for the better in the purity of the public water supply of each city. These facts, disclosed by a study which we believe to be of a high degree of statistical accuracy, are certainly striking and suggestive; and inasmuch as we have been unable, even after the most careful investigation, to discover any other possible explanation of them, we are forced to the conclusion that *a considerable portion of the decline in mortality from tuberculosis in Lowell and Lawrence during the year immediately following their change from polluted to pure water supplies was due to that change.* In other words, *polluted public water supplies appear to increase the general mortality of communities from tuberculosis; pure water supplies to diminish that mortality.*

Dr. Reincke, in discussing the effects of purification of the public water supply of Hamburg by the sand filters introduced in 1893 upon the mortality from specific causes, noted among other things a marked decrease in mortality from diseases of the respiratory

organs, including pulmonary tuberculosis. For years the tuberculosis mortality had been declining in Hamburg. It continued to decline after installation of the sand filters, and, as is now interesting to note, at a somewhat greater rate. Dr. Reincke, however, expressly avoided attributing any of the decline in tuberculosis to the purification of the public water supply, preferring rather to look for its cause in those general improvements in the sanitary conduct of life in which the time abounded, and which were naturally most to be expected in a city like Hamburg, just recovering from a disastrous epidemic of Asiatic cholera. For us, on the other hand, when taken in connection with the phenomena in Lowell and Lawrence, this decline in tuberculosis mortality in Hamburg, which was comparatively sudden and rapid after filtration began, takes on another meaning; and we cannot escape the conclusion that it was caused, in some small part, at least, by the purification of a previously polluted water supply. Further evidence pointing in the same direction will be given in our complete paper, and therefore need not be recited here.

If it be granted that some connection really exists between polluted drinking water and pulmonary tuberculosis, such that the substitution of a pure for a polluted supply causes a marked decrease in mortality from that disease, the question naturally arises, Is this decrease due to diminished infection; or is it due to increased vital resistance; or is it due to a co-operation of these principal factors? This problem we have not yet been able to solve to our own satisfaction.

CHAPTER XV.

THE RELATION OF THE INDUSTRIES OF WORCESTER TO TUBERCULOSIS.

Albert C. Getchell, M.D.

Worcester is near the central part of the State, forty-four miles from the ocean, and lies on the eastern slope of the uplift of land called the central plateau of Massachusetts. The contour of the land is uneven, the hills being elevations of the earth's crust, and also glacier formations called drumlins. The altitude varies from four hundred and eighty feet, that of the Union Railway Station, to one thousand feet within the corporate limits of the city. Already the city has covered many hills of seven hundred feet elevation and is spreading out to higher ones. The estimated population is 147,084.

By far the largest number of manufactories are situated along the lines of these railways, although several important ones are in other parts of the city, even on the outer border of thickly settled portions.

The industries are varied in character. The following are the twenty largest. The estimated number of employees is obtained from the Board of Trade: —

	Persons employed.
American Steel and Wire Company,	6,000
Crompton & Knowles Loom Works,	2,000
Graton & Knight Manufacturing Company (leather belting),	1,000
Worcester Corset Company,	1,000
United States Envelope Company,	1,000
Norton Company (grinding wheels),	1,000
M. J. Whittall Carpet Company,	1,000
Winslow Skate Company,	550
Harrington & Richardson Arms Company,	550

W. H. Burns Company (underwear),	500
George C. Whitney Company (holiday goods and valentines),	450
Spencer Wire Company,	400
F. E. Reed Company (machine tools),	375
Heywood Boot and Shoe Company,	325
Reed & Prince Manufacturing Company (screws, bolts, rivets, etc.),	200
Wire Goods Company,	200
Coes Wrench Company,	190
Worcester Machine Screw Company,	175
Curtis & Marble Manufacturing Company (cotton and woolen machinery),	110

Besides these manufactories and others doing similar work, — for many of these are duplicated several times, — are factories for the manufacture of agricultural machinery, machines for envelope making, paper making, horse clipping, grinding and drilling, planers, lathes, steam boilers, engines, elevators, water meters, turbine water wheels, iron bridges and construction material, drop forging, pressed steel, razors, card clothing, pianos, organ reeds, simplex piano player, builders' supplies, wooden boxes, wall paper, sewer and drain pipe, building stone and a large number of miscellaneous articles.

It is estimated that about twenty-five thousand persons are employed in the industries of Worcester, of which 75 per cent. are males, a very large proportion of them being skilled workmen, commanding good pay. The housing of these operatives is almost entirely in private and not in corporation houses. The prevailing style of house for the average workman is a wooden building, commonly called a three-decker. This consists of three separate tenements, superimposed one on the other. Usually a small plot of land surrounds these houses, and very large numbers of them are on high land. The water supply is derived from large reservoirs in the high land west of the city, and is abundant and of good quality. The sewage is treated by chemical precipitation, and

discharged into a river emptying into Narragansett Bay, forty miles away.

In order to get an idea as to which industries furnish the largest number of tubercular persons, I have taken a series of one thousand cases which have come under my personal observation during the last four years. Of these, four hundred and sixteen applied at the Worcester office for examination for the State Sanatorium; four hundred and six are from the Tuberculosis Clinic at the Worcester City Hospital; and one hundred and seventy-eight are from my private practice. Not all of the first and third of these classes lived in Worcester, but nearly all did, and most of the others came from the neighboring towns. Of those applying at the Tuberculosis Clinic, all must be residents of Worcester. Of the first two classes, not all were surely tuberculous, but all came because they were supposed to be tuberculous. It is evident no one would apply for admission to the State Sanatorium unless there were definite reasons for supposing he had tuberculosis. No persons are received at the Tuberculosis Clinic except those referred from other departments of the hospital, or those whom the admitting officer, a competent physician, thinks to be tuberculous. The cases from my private practice I have gone over carefully, and have included only those which are without doubt of this class. Of these thousand cases, seven hundred and twenty-three may be grouped into the following classes, according to occupation: —

Housewives,	225
Machinists and miscellaneous iron workers,	82
Children and students,	66
Clerks,	65
Cotton, woolen and carpet mill operatives,	55
Domestics,	35
Laborers,	35
Leather workers, including shoemakers,	33
Wire workers,	31
Drivers, — milk wagons, etc.,	17

Peddlers,	16
Carpenters, masons and painters,	15
Dressmakers and seamstresses,	15
Underwear, corset makers, etc.,	13
Teachers,	10
Street and steam railway employes,	10

I have made no note in this paper of those occupations whose number fell under ten, except the following, which are generally supposed to be productive of consumption, namely, those in which a large amount of grinding is done. They are: —

Emery wheel works,	1	Skate shop,	1
Wrench shop,	1	Grinding shops,	2
Razor factory,	1	Pistol shop,	3

It is to be noted that, while grinding is done in these factories, only a comparatively small number in each shop work at grinding.

Mr. James C. Coffey, the executive officer of the Board of Health, investigated the same question from another point of view. He went over the death returns of the year 1904, to determine the occupations of those who died in that year from tuberculosis, with the following result: —

Laborers,	46	Painters,	7
Machinists,	45	Stone-cutters,	6
Clerks,	41	Masons,	5
Wire-workers,	28	Plumbers,	5
Students,	21	Saleswomen,	5
Shoemakers,	16	Teachers,	5
Carpenters,	14	Armorers,	4
Teamsters,	13	Agents,	4
Leather workers,	10	Cooks,	4
Mill operatives,	10	Domestics,	4
Dressmakers,	9	Farmers,	4
Grocers,	9	Gardeners,	4
Barbers,	8	Nurses,	4
Bar-tenders,	7	Porters,	4
Moulders,	7	Screw-workers,	4
Printers,	7	Wood-workers,	4
Polishers,	7		

The figures of these two groups of cases pointed to no definite industry as productive of tuberculosis. Still, in order to investigate the question more directly, I visited personally most of the largest plants and many of the smaller ones. I was given every opportunity to thoroughly inspect them, in several instances my guide being the superintendent of the place. I found the owners of the mills and superintendents generally interested in the subject, and in some instances particularly so. The hygienic character of the buildings varied directly with their age, the newer ones being always better, — in many instances models of proper mill construction. Some of the plants were the growth of more than half a century. In one of them I was shown a room in which the old overshot wheel was first installed, still used for manufacturing purposes, — a dark, ill-ventilated room. I particularly inspected all factories in which either wet or dry grinding is done. In some of the factories the grinding was done in large, light, above-ground rooms; in others, in darker basements. But everywhere I found an efficient system of exhaust pipes, through which the dust of the grinding was removed, and the air in the vicinity of the grinding machines was apparently as free from dust as that in other parts of the same factory. The foremen of these factories talked very freely with me about consumption among their employees, and from their experience, as well as from my own investigations, I could not attribute to grinding a causative factor. In these visits I was impressed with the care taken to keep the factories clean; in some places men or boys were constantly employed sweeping the floors and removing the dirt.

The histories of the thousand cases which form the basis of this paper were taken on similar printed forms. One of the questions related to the source of infection. Personally, this subject has very much interested me, and I have laid stress upon it in examinations. But I can recall only one instance in which an operative thought he contracted the disease at his work. That was an op-

erative in a hat shop, who said that a fellow workman had had a cough for some time and freely spat on the floor.

From this study my conclusions are that no industry in Worcester stands in any particular causative relation to tuberculosis. If it shows anything, it emphasizes the belief that the disease implants itself in the home; that it develops most readily in those who follow a sedentary life (note the large number of clerks and students); that it occurs more often in the unskilled workman, who earns small wages, and consequently cannot house and feed himself adequately.

There can be no question that certain occupations are worse for the already tuberculous than others; and there can be no question as to the duty of the community to insist that all work places be as healthy as the requirements of the particular industry will allow, that the well may keep well, and that those predisposed to tuberculosis or having the disease may not be so weakened by unhygienic surroundings that they will succumb to it.

An efficient campaign against tuberculosis means clean streets, clean, light and well-ventilated stores, offices, public places, schools and factories; but in this community at least, we must look to the home as the main breeding-place of the disease, and it is upon the home that we must concentrate our main energies for its extermination.

CHAPTER XVI.

TUBERCULOSIS AMONG THE GRANITE WORKERS OF QUINCY.

John A. Gordon, M.D.

It has long been recognized that the proportion of deaths from pulmonary tuberculosis among the granite workers of Quincy was relatively very large; but it was not until a careful investigation of the vital statistics of the city was made that the extent of the disease became fully evident.

For twenty years there have been on an average twenty-five hundred men employed in the Quincy granite works. Of these, about five hundred are quarry men, twelve hundred granite cutters, three hundred polishers, one hundred and fifty paving cutters, and the remainder are made up of tool sharpeners, boxers, teamsters, carriers and others whose occupation is incidental to the business.

In this report only the causes of death among the granite cutters, quarry men and paving cutters will be considered, as it was found that the causes of death among polishers, sharpeners, boxers, teamsters and carriers are essentially the same as among men employed in other occupations.

On careful examination of the records of death in Quincy for the ten years, *i.e.*, from 1897 to 1906 inclusive, it was shown that the total number of deaths among granite cutters from all causes was two hundred and three, of which ninety-three, or 46 per cent., were from tuberculosis. The average age was fifty-nine.

The following table shows the relation of the number of deaths from tuberculosis to the total number of deaths among granite cutters by years for the same period: —

YEAR.	Total Number of Deaths from All Causes.	Total Number of Deaths from All Forms of Tuberculosis.	Percentage of Total Number of Deaths due to Tuberculosis.
1897,	19	9	47
1898,	26	10	38
1899,	20	6	30
1900,	17	10	59
1901,	23	12	52
1902,	23	9	39
1903,	18	7	39
1904,	17	11	65
1905,	25	10	40
1906,	15	9	60
	203	93	46

Of these ninety-three deaths from tuberculosis, forty-six, or nearly 50 per cent., occurred between the ages of forty and sixty, as will be seen from the following table: —

AGE.	Number of Deaths.
Under 20,	2
20–30,	11
30–40,	13
40–50,	23
50–60,	23
60–70,	18
Over 70,	3
	93

Twelve deaths occurred among the paving cutters, of which five, or 41.5 per cent., were due to tuberculosis, and the average age was fifty-four years.

Nine, or 22.5 per cent., of the forty deaths among the quarry men were due to tuberculosis. The average age was forty-eight. The largest proportion of deaths from tuberculosis, or 15 per cent.

of the whole number, occurred between the ages of forty-five and fifty years.

The number of deaths from tuberculosis among the polishers, boxers and tool sharpeners averaged only about 15 per cent., and is essentially the same as that from tuberculosis in other occupations found in Quincy.

The whole number of deaths in Quincy during the above-mentioned period, *i.e.*, the years 1897 to 1906 inclusive, was four thousand two hundred. Of these, but four hundred and fifty-four, or 11 per cent., were from tuberculosis. If we deduct the fourteen hundred deaths in children under five years from this number, very few of which were from tuberculosis, leaving twenty-eight hundred deaths in persons over five years of age, in ten years we get an average death-rate from tuberculosis which is only 16 per cent. of the total death-rate. It will thus be seen that the number of deaths from tuberculosis among granite cutters and quarrymen is relatively very large.

It is interesting to note that in the two hundred and fifty-five deaths among granite cutters, quarrymen and paving cutters, eighteen, or 7 per cent., were from pneumonia, and fifty-four, or 21 per cent., were from disease of the circulatory system (heart disease, thirty-six; arterio-sclerosis, seven; apoplexy, eleven).

In my experience of thirty-seven years among the granite cutters of Quincy I have found that a large number were affected with chronic bronchitis and emphysema, and in almost all cases the bronchitis preceded the development of tuberculosis by a considerable period.

There is one feature which somewhat lessens the serious aspect of the condition under consideration. The deaths from tuberculosis occurred generally somewhat late in life, differing materially in that respect from the usual history of the disease. But it is deplorable, inasmuch as in nearly 50 per cent. of the cases the men

were infected during the active working period of life, and at an age when their time is most valuable.

In investigating the causes of this large proportion of deaths from tuberculosis among the granite workers of Quincy, it is important to examine the peculiar conditions attending the quarrying and cutting of granite as carried on at the present time. The granite from these quarries is a syenite, consisting of quartz, felspar and hornblend, with an occasional mixture of mica, and is in consequence very hard, cutting with difficulty. The granite is quarried by drilling holes in the face or surface of the rock about one and one-half inches in diameter and several feet deep. These holes are charged with powder, which, when exploded, breaks off large masses of the rock. These masses are subdivided into blocks by drilling smaller holes in them and splitting with ingeniously devised wedges inserted in these holes. The drill for the large holes is a steel bar one and one-quarter inches in diameter, with a flat cutting point. It is operated by two men. One man holds the drill and turns it about in the hole, while the other man hits it on the head with a heavy sledge hammer. Every blow forces from the hole a quantity of fine dust from the disintegrated granite, which is liable to be inhaled by the man who holds the drill. The smaller holes are drilled by one man, who holds and turns the drill with his left hand while he hits it with a heavy hammer held in his right. This also sets free a large quantity of fine dust. In many cases these drills are worked by compressed air, when a much larger amount of dust is produced. In most cases the quarries are from twenty-five to a hundred and fifty feet deep, and, as there is no air stirring, the quarrymen are almost constantly enveloped in a cloud of this fine dust.

The cutting sheds where the granite is finished are built about a semi-circular or rectangular yard, usually of boards, with a tight roof to keep out the rain. They are from twenty to thirty feet

wide and about twenty feet high, and vary in length according to the size of the yard and the number of men employed. Each man has a ground space of about fifty square feet. There are doors along the front and back of these sheds about eight feet high, which can be raised or lowered by pulleys. Some of the sheds have closed windows in the walls above these doors, others have ventilators of slanting boards along the ridge pole. These ventilators are of little use, however, in removing the dust. In the very hot season the front and back doors are usually open, and there may be a current of air in the sheds. In cold or windy weather the back doors are usually shut, and in the winter season both front and back doors are kept closed and the sheds heated by stoves. In this case the sheds are always full of dust. The workmen are frequently exposed to draughts not sufficiently strong to carry off the dust, yet sufficient to chill the body after perspiring.

The blocks of granite are brought into proper shape and trimmed by clipping off the superfluous parts with a sharp-pointed chisel and heavy mallet. They are then finished or cut with the bush hammer, which consists of a handle about two feet long and a head made up of from three to twelve blades of hard steel two and one-half to three inches square, with one side double-bevelled to a cutting edge. These are bolted together to the head of the hammer so as to form parallel grooves on the cutting face. By hitting the block of granite with these bush hammers the surface is gradually disintegrated and thrown off in the form of a very fine, almost impalpable powder, which floats about the cutter in the form of a cloud of fine dust. It is inevitable that the dust should be inhaled with every breath. In some cases the bush hammer is operated rapidly by compressed air, and in these cases a still greater amount of dust is produced. The particles of dust are very fine and float in the air for a con-

siderable time. When seen under the microscope they present the appearance of elongated flattened masses, with numerous sharp angles and pointed spiculæ. The injurious effects of the constant inhalation of the pulverized granite on the lung tissue is well known.

The granite cutter usually works in a stooping posture, with the upper part of the body bent over the stone; and this position seriously interferes with the breathing capacity of the chest. This is particularly the case with the letter cutters and carvers, who have to look closely at their work.

We find, then, that the granite worker is exposed to three peculiar conditions: dust of a particularly irritating character; constrained position of the upper part of the body; and excessive draughts.

The determining factors in the development of tuberculosis are the state of health and the susceptibility of the individual, the vulnerability of the lungs and the duration and intensity of the exposure to the dust and abnormal posture.

The remedy is difficult to apply, but not impossible. We must first inaugurate a crusade of enlightenment in the matter. It is found, generally, that the granite manufacturers and the granite workers themselves are very unwilling to believe that the occupation is extra-hazardous, or that the dust is a dangerous element. If the facts were brought forcibly to their minds, there is every reason to believe that both the manufacturers and the workmen would voluntarily do a great deal to ameliorate the condition under which the work is done. In the first place, larger and better ventilated sheds should be provided, so that each workman would have more room, and would not be exposed to the dust produced by his fellow workman. Each workman should exercise more care in the management of the dust which he produces. Instead of sweeping the dust from the stone on which he is working and scattering it into the air again, he should gather it up carefully

with a brush and deposit it in a receptacle for the purpose. The sheds should be provided with windows sufficient to give abundance of light, so that it would not be necessary for the workman to bend so closely over the stone in order to follow his marks and lines. Proper appliances should be used to place the stones at a suitable height, so that the cutter could work in an upright position, and he should be taught to appreciate the importance of working in this position. He should understand the importance of protecting himself, when perspiring, from exposure to the cold air, while the position of his stone is being changed. He should be made to understand his susceptibility to tuberculosis, and the danger he incurs from sleeping and living with others who are suffering from the disease. He should change his occupation when the symptoms of chalicosis or dust poisoning begin to show themselves, before the destructive processes in the lungs have become advanced.

Respirators made of wire netting and containing a suitable sponge to cover the mouth and nose have been recommended, and used in some cases, but they are unsightly and inconvenient. The sponge soon becomes moistened by the breath and clogged with dust, thus requiring frequent washing and cleaning. It further interferes with speaking.

It seems possible that a contrivance for aspirating the dust might be made similar to those employed in shoe factories, wood-turning shops and other dust-producing works, the use of which is obligatory in many cases. This would involve considerable expense, especially for the smaller sheds, and might make the work of granite cutting unprofitable. But if the several smaller manufacturers would combine and build more commodious and more suitably constructed sheds and equip them with contrivances for handling and placing the stone for convenience in working, and install in them large aspirating pipes with adjustable funnels that could be brought in front of each cutter, into which the dust

would be drawn as soon as made and carried out of harm's way, this would be made possible. It does not seem that the expense would be very excessive, as in all the large manufactories they already have powerful machinery for the production of compressed air for operating the pneumatic appliances and surfacing machines, and the dust itself might even be used as a by-product for various useful purposes.

APPENDIX.

List of Articles on Tuberculosis by Massachusetts Authors.[1]

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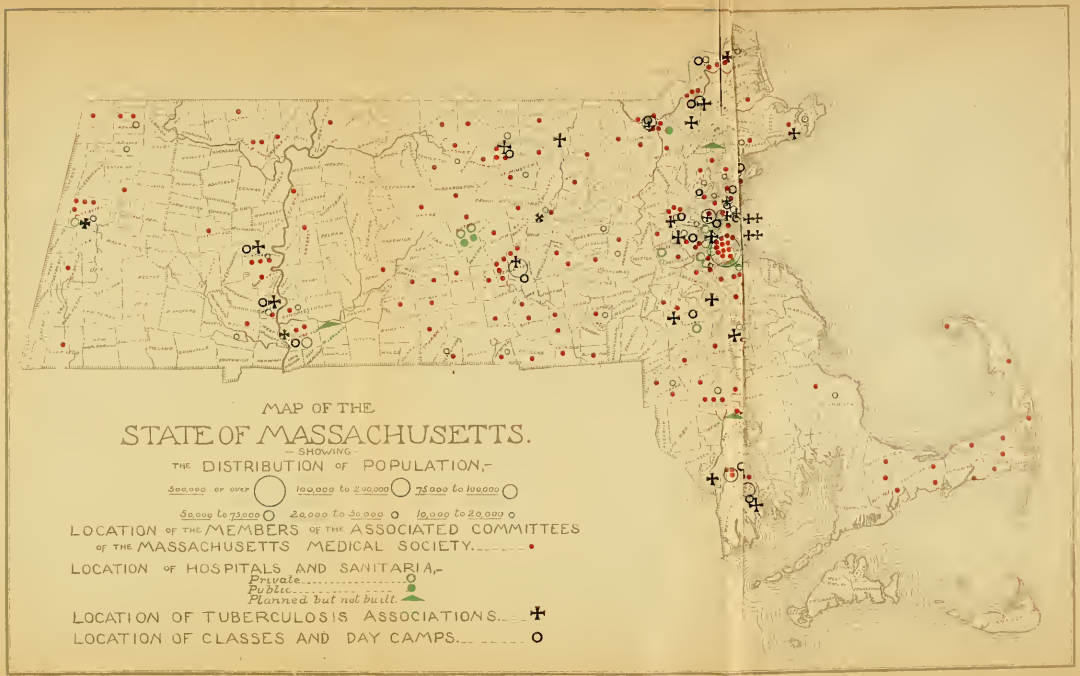
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SHOWING
THE DISTRIBUTION OF POPULATION,-
500,000 or over
100,000 to 200,000
75,000 to 100,000
50,000 to 75,000
20,000 to 50,000
10,000 to 20,000
LOCATION OF THE MEMBERS OF THE ASSOCIATED COMMITTEES OF THE MASSACHUSETTS MEDICAL SOCIETY.
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